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EDITORIAL NOTES.

Know Man as well as Matter.

NOT all men could have written the address that Mr. Charles Carpenter, D.Sc., delivered to the London and Southern District Junior Association last Friday evening. It was a deliverance full of precept and philosophy—built up not from a diligent research into the sayings of wise men who have lived in the past, but from personal experience, starting from the position of many of the juniors of to-day in the gas industry, and on through every conceivable office that can be occupied on the engineering staff and in the administration of a gas undertaking of large magnitude. Failures in life are often due to a too narrow conception of what one ought to know and ought to do; but if all be everything that our present monitor lays down for the guidance of those whose ambition in life is to make a success of themselves in relation to their work and their fellow-men, then the world and life would be all the better for it. It is not, however, the impossible that Mr. Carpenter puts before the juniors. It may have sounded in some ears, it may read to others, as something that could be described as "counsel of perfec-"tion." But those who listened, and those who read, with care will (although there may be a little dissent upon not vitally important points) come to the conclusion—they cannot fail to do so—that all the address contains rests upon a solid and practical substratum.

There is a sense of power in knowledge. It is a good thing in these times to become a specialist in something in the particular walk of life to which one devotes oneself. But the specialist may be a danger to himself and to other people, if he does not seek to learn something of things and people that are beyond the borders of his own immediate and circumscribed interests and, maybe, profound knowledge. Such a man may become supercilious, and may believe that the whole store of knowledge in one particular is concentrated in himself, and that no one can hold a thought or an opinion on the subject that has not been the specialist's already, or, if one does and it is not in consonance with his views, then it is little short of heresy. They are men whose service in the world is limited by their concentrated knowledge. This is one of the things against which it is necessary for the individual to defend himself, by getting away from himself through study and the gaining of knowledge of the living world around him. It is one of the first lessons of the address—that man should know man. Man should know himself and his fellow men. He should train himself to read other men. But there caution is necessary.

Mr. Carpenter, in this connection, speaks of the guide the face affords to character. Admittedly the expression of the face is sometimes a good index to character, as well as to intelligence. But we would warn the juniors against always taking the countenance, without other considerations, as a definite index. If they do, they will frequently run into error, and there will be misjudgment. We know of the immobile face which we have found in other ways does not by any means reflect the workings and the emotions within. We know of the immobile face that suggests the inflexible martinet. But the face is deceptive. Behind the sphinx-like gravity, there may be a depth of feeling of the humane kind that speaks through beneficent actions, in which justice to fellow men of all grades takes a foremost place. There rises up an instance of a face dark and gloomy and not overburdened with the indications of intelligence. It is the face of a man who attained high rank in his profession solely through actual accomplishment, and he won honour, not only from those for whom he worked, but from those in subsidiary positions with whom he worked, and who would have followed him at his bidding to the "world's end." Men must be judged by their actions, as much as by external presentment. In this matter credit must be given to the principle of exceptions to every rule, as this is a safeguard against what may be an irrevocable injustice. However, to be wholly successful we must, as Mr. Carpenter urges, carry into our lives, and into the gaining of knowledge of men, those same systematic principles that must apply to one's work. In this work, to get the best out of it, the engineer must know his materials. He must investigate them, and learn precisely what they will do, in order to obtain the highest economy, efficiency, and safety from them. Above all this, however, the engineer must know the men for whom and with whom he works, and to do this he must first know himself. Unless he sets himself to acquire this knowledge, his professional life cannot be the complete success it otherwise would be; and he may become, through the deficiency, a failure—partially or entirely. In other words, the study of man (combined with personal conduct) must be as complete as the study of material and scientific principles. We like the plain way in which this is emphasized in the address before us.

To be all this, to have the ability to examine men and materials, to act justly by the one and to obtain good result from both, and to properly understand defects and their remedies, we must possess certain qualifications; and here on a minor point we come into conflict with Mr. Carpenter. The power of scrutiny and decision in man depends upon his personal mental abilities, supplemented by the sharpening-up which the knowledge of exact scientific principles confers. The power of observation may exist; the power of correct observation comes from training, and a knowledge of principles. Mr. Carpenter refuses to be a party to the closing of the path to the attainment of the legitimate ambition of anyone; and for the attainment of the goal of ambition, he would give scope to all—to the poor, as well as to the more favoured aspirant. Brains and not the accident of position conferred by birth are wanted in the world's affairs; and hereditary claims are more than ever to-day finding their proper level by and through competitive forces. Not only in the engineering but in the commercial department of a gas undertaking, the juniors are advised to attain both practical and theoretical knowledge, and not merely a knowledge of gas but of men and customers, and how they should, in the interests of the concern, be respectively dealt with. The aim of every man should be to make himself in his sphere a primary and not a secondary product; an essential, and not something dispensable. In addition to his practical training, he should take advantage of those institutions that will afford him theoretical knowledge. Mr. Carpenter advises five years' practical workshop training for the engineer, supplemented in the evenings by the acquisition, at the institutions established for the purpose, of theoretical knowledge.

In our opinion, the students will be better off than those whom Mr. Carpenter describes as more "fortunate," because the attainment of theoretical knowledge will run simultaneously with their practical training. "If fortunate," he goes on to say, "one, two, or three years of university "teaching, or its equivalent, will enable him [the student] "to develop scientific knowledge of those problems with "which he has been *during* his apprenticeship brought face "to face, and will give him an opportunity of obtaining "those credentials which should be as necessary to the "practiser in the branch of mechanics as of science." Be it noted that Mr. Carpenter has previously been urging upon the juniors the necessity of being able to read materials as well as men. We do not expect a man to construct immaculate and symmetrical sentences without a knowledge of the principles of syntax; and we ought not to expect a pupil to get the most value out of his engineering apprenticeship without he has had an opportunity of gaining a prior, or alternatively has the opportunity of concurrently gaining, knowledge of principles, so that he may know the why and the wherefore of the things that he is taught to do during his apprenticeship. Under Mr. Carpenter's

system, he would not let the pupil who is fortunate enough to be in the position to command a few years at a university into the secret of the reasons for what he does in the workshops until *after* his apprenticeship, and thereby debarring him, during that period, from properly doing the very thing which Mr. Carpenter says is so essential to success in an engineer. To scrutinize, and to bring reasoning to bear upon his practical training in the workshops, the pupil must have first a knowledge of theoretical principles.

There is much else in the address that invites comment and emphasis—not contentiously, but in agreement. We cannot, however, spare space or time to allude to them all. The warning, however, against "cocksureness" must here be referred to. Mr. Carpenter does not seem to approve of this characteristic of some men. We, on the other hand, while not liking to see an obtrusive amount of it, rather favour a little admixture of it in a man's character. We have found a few useful particles of it in Mr. Carpenter's own character; and it has not been out of place. In support of his warning against the trait of "cocksureness," he says that "there were many processes suggested long since "which would have achieved fruition had those connected "with their trials not been quite so cocksure that they were "doomed to failure." That is good illustration up to a point. But a little cocksureness mixed with prudence is not bad. It sometimes helps one to win. It was because Mr. Carpenter possessed some of the characteristic against which he warns others, combined with his encouragement of Mr. Evans and his own personal help and advice, that the catalytic process of purification has been so successfully developed at the Old Kent Road. It was not "cocksure-"ness" that induced prior workers to think that the process of the heat purification of gas was doomed to fail; it was because they failed to detect certain essentials to success which have happily since been discovered at the Old Kent Road, through diligence, the application of knowledge and thought, and a part of the characteristic against which there is caution.

The address is not a long one; but it bears thinking over in its every part. We unhesitatingly recommend the juniors of the gas industry to place it among those things that come within the category of principles fundamental to the making of the very highest successes of their lives.

Work on the Birmingham Coal-Testing Plant.

It would be just as well if the titles of communications to our technical organizations conveyed some indication as to their real contents. The contribution that Mr. E. W. Smith and Mr. G. C. Pearson made to the Midland Junior Association on Saturday bears the bald heading "The Birmingham "Coal-Testing Plant;" and naturally one, duty bound, commenced to read it anticipating that it would resolve itself into another description of the famous testing plant which has been in the past so lucrative in the production of valuable information—valuable not only to Birmingham, but to the gas industry generally—bearing upon the technics of gas manufacture. Some readers of the "Journal" who are not compelled to peruse the communication might be disposed, from the title, to pass by the paper in the supposition that it was merely a reiteration of some previously published descriptive matter. But in reality the paper deals in five-sixths of its compass with investigation work carried out by the authors in connection with the coal-testing plant, and only a small introductory part is devoted to a description of the plant itself. This reference to the matter will caution readers against being deceived by the uncandid and uncomprehensive title. About the plant itself, we will not say anything other than to compliment the Corporation Gas Committee upon the enlightened policy which has provided a working-scale installation, not only of horizontal retorts, but of Dessau and Woodall-Duckham retorts, which enables the study of the behaviour of, and the results obtained from, different coals and different mixtures in the three systems, and investigation of the several pertinent matters bearing upon make and quality of the primary and secondary products. We are hoping shortly to hear more of the results of the work that has been proceeding at the plant in connection with the liquid purification system in regard to which Dr. Davidson first whetted curiosity at the Institution meeting last June.

The fact that this paper was prepared for a Junior Association meeting is a sufficient justification for some of the material composing it. For its designed purpose, it is in part useful; but for those who have traversed much the same ground before, and are cognizant of the results of research into certain of the matters, there is not a great deal that is informative. Following the description of the plant, a section of the paper is devoted to some calorific power records, working with the horizontal, Dessau, and Woodall-Duckham installations. The value as an index to the working of carbonizing plants of such instruments as the Simmance-Abady "Calorgraph" or the Beasley recording calorimeter is now fairly well accepted in the gas industry; and with them, varying the methods of working with the different plants, of course, calorific power charts showing different characteristics can be obtained *ad infinitum*. Among the charts, the straight calorific-power line of the gas from the Woodall-Duckham plant cannot fail to arrest notice, in comparison with the curves for the horizontal retorts and the intermittently charged verticals. A microscopic examination is almost required to see any deviation from the 500 B.Th.U. line. In a comment on this particular chart, the authors say: "It would not be easy to maintain a line like "this for long periods; it would be similar to gas from plants "working intermittently if the gas were sampled from a "holder." The rugged calorific-power lines shown for the horizontal and the intermittent working would, as the authors indicate, be levelled-up to a more or less regular line in daily work on a large plant, as well as by tests being made of the gas sampled from the holder. But even assuming that the calorific line for the gas from the continuous vertical retorts started off with only the same evenness of line as can be obtained from the diffused gas in the holder produced by intermittent working, this shows that the continuous system begins with, in this particular, the advantage (for what it is worth) of a greater uniformity. Similar curves have been published on various occasions; and the same straight calorific line has been shown in them for continuous working—one instance being found in Mr. J. G. Newbigging's paper before the Institution in 1911 for the Manchester installation of Glover-West retorts, when making over 13,000 cubic feet of gas per ton. The line, in that instance, has also almost imperceptible oscillations from 500 B.Th.U.

In the next section of the paper, there is information regarding illuminating values as obtained from different burners—the two commonly used standard argand and ordinary flat-flame burners. We have tried in vain, while reading this part of the paper, to eliminate from our minds very similar work that has been done in the past. But we cannot; and the failure to do so makes us ask what real value can be placed upon this section of the paper. The tests only appeal to us as having academic interest with very little or nothing about them that was not known before, and that is not to-day of practical value. Members of the technical staff at Birmingham seem to be singing in unison in favour of the flat-flame gas-burner user, and to be imploring with one voice that these should be given full consideration. This sort of thing comes rather late in the day; and it suggests that the flat-flame user shall be allowed to continue, for any length of time that his will dictates, an obstacle in the path of progress, and an obstacle to the other consumers obtaining the composition of gas that best suits them, or that is most economical, and adapted to the realization of high flame temperatures. "The time has not yet come," say the authors, "for the illuminating value of town gas to give "place entirely to the increasingly more important con-"sideration of calorific value, although the tendency at the "present time is to reduce the illuminating standard, and to "adhere more closely to the heating standard." Further on, they also remark: "Much is to be said for the conten-"tion of Dr. Davidson, made in his Young Memorial "Lecture, that while a considerable percentage of the sale "of gas was for use in flat-flame burners, then this ought "to be considered in fixing an illumination standard." We do not quite know what definition the authors would put on the term "considerable;" but we do think that, however they looked at it, an expression of modified meaning in relation to quantity would have to be applied. Whatever the figure, however, if the matter is further examined from the point of view of work done by the quantity of gas used for all purposes other than in flat-flame burners, the percentage of useful result from the latter will be found to sink into utter insignificance in the contrast. The people who have to be studied and encouraged are the great majority who are putting gas to use in the most advantageous manner; and these are the people who alone should be considered in the matter of providing a reasonable quality of commodity.

The paper does not enlighten us in any way as to how the

authors think the interests of the flat-flame consumers can be specially studied without affecting the interests of those consumers who are building-up the real and solid business upon which the gas industry must in the future stand. The case that the authors present, if it points any definite lesson, is conclusively favourable to an early dissolution of standard illuminating power testing and of all that pertains to it, and to putting an end to a most unsatisfactory condition of things, though that condition, looked at practically, is not so bad as it is painted in the paper. Much of the authors' work and many of the deductions from it were covered by the articles that appeared in our columns early in 1910 on "The Case " for the Standard Burner Bill," and by the evidence that was subsequently laid before the Committees during that ever-memorable session. The authors submit that their work shows that "all" methods of testing illuminating power are unsatisfactory, which "all" embraces the "Metropolitan" No. 2 burner. In this assertion there is one reason for the abolition of the illuminating power standard. They also show that gases that contain a high percentage of hydrocarbons, especially rich carburetted water gas with its heavier hydrocarbons, require a high calorific power to properly incandesce the carbon particles in the flame for the purpose of obtaining the highest luminosity. It does not therefore require much deliberation to see that the best gas (regarded from the point of view of the luminous flame alone) for the so-called "considerable" percentage of flat-flame users is of a kind that is not economically the best for all the other users, because they do not want to expend heat energy in uselessly dealing with an amount of hydrocarbons that depreciates the value of the gas for them.

Still, with lingering tenderness for the flat-flame consumer, the authors state that there is not one of the standard burners that will give results consistently higher or lower than those obtained by the consumer using luminous flames. But let us get the position properly focussed. The No. 1 burner, we think the authors will admit, is unfair to gas of the lower values. It was shown by us, nearly four years ago in stating the case for the "Metropolitan" No. 2 burner, that this gave the better results—results rising and falling co-incidently with the rise and fall of the light from the flat-flame burner for different qualities of gas. This it was impossible to obtain with the No. 1 burner. It was also shown that the No. 1 burner was unsuited to the higher qualities of gas. In this connection, we do not see there is much point about the authors' submission that, as the two burners pass beyond (say) the 19-candle stage, they attain closer equality in result, until equality is reached at about 22 candles. We need not to-day bother our heads about what the burners do at those stages—for such gas is not wanted by people who require flame temperature, and a gas that can be promptly aërated for power and other purposes, nor is it wanted by flat-flame burner users. Therefore the best standard burner, however "unsatisfactory" the authors may find it, for the gas that is suited to the day (while the standard is illuminating power) is the No. 2; and it serves even the flat-flame consumer better than the No. 1, as there is at all events a proportionate relation between the illuminating power obtained by it and by flat-flame burners with gases of different qualities—qualities that are of the most practicable order for present-day use. It is not the fault of the gas suppliers that the flat-flame consumers realize so many candles below the standard for a given consumption. The gas supplier wants 36 inches to the yard; but Parliament has never given him the right to prescribe what burners or other appliances his customer shall use. If his customer likes to cheat himself, that is his own look-out. The gas supplier can only advise; he is not called upon to pander to obstinacy and indifference. Therefore methods of use that are far from the best must not be allowed in any way to influence the adoption of a standard of quality, nor the means of testing. Birmingham, by the way, is asking for the adoption of the No. 2 burner.

There is no question as to the valuable economical effect the No. 2 burner has had, through giving a proper value to the gas, upon manufacturing operations. The authors admit this, though previously they contended that "all" the methods of testing illuminating power are "unsatisfactory." To this question, there is more than the one aspect of sympathy for the user of flat-flame burners. The No. 2 burner has stretched the opportunities of the gas maker, and has assisted him to look upon the new systems of manufacture as valuable in complying with current needs. The authors point to the usefulness of the vertical retort in making a genuine low-grade gas; steaming, too, especially with a rich coal has a real contributory effect. In fact, a very brief study shows how politic it is to consider the question of standards and methods of testing from the point of view of greatest and most economic service rather than be held back by consideration for a diminishing fraction of the whole number of consumers.

The section of the paper in which an account is given of the results of coal-liming experiments is summed-up in the statement that the authors cannot find that anything much is gained by the process, other than a reduction of the sulphur content of the gas, and that for this purpose the system is an economical and convenient one. As that is the main purpose for which the process as now worked was adopted at Cheltenham, and not for the results that under the Cheltenham conditions were found to run parallel with the chief object, the confirmation of efficiency in this direction is useful.

Main or Service-Pipe?

THOUGH the law is not on their side, under the circumstances of the Whittington Gas Company, we cannot help sympathizing with them over the matter in which they were plaintiffs and the Chesterfield Gas and Water Board defendants, and which was discussed last Tuesday before Mr. Justice Eve. The case turned upon the definition of the two terms "main" and "service-pipe." What is a main? What is a service-pipe? Was the pipe in question a "main" or "service-pipe"? The simple facts are these: The Chesterfield Board are statutorily prohibited from laying mains in, or extending mains into, certain parishes supplied by the Whittington Gas Company without their consent; but this does not apply to service-pipes. There are, as a matter of fact, gas consumers on the borders of the Whittington Company's area who have for years been supplied with gas by the Board through service-pipes, from a main running along the Sheffield Road, the centre of which forms the division between the parish of Whittington and the borough of Chesterfield. The occupier of a foundry in a thoroughfare known as Foundry Street had been supplied with gas by the Whittington Company; but, it appears that, on the adoption of a gas-engine, he asked the Chesterfield Board for a supply of gas. A 2-inch pipe was laid a distance of 88 yards for the sole purpose of supplying the foundry. The Board did not seek the consent of the Whittington Company, holding that this was merely a service-pipe; while the Whittington Company contended that it was an extension of the Sheffield Road main. This was the whole point that Mr. Justice Eve had to decide. His Lordship came to the conclusion that the pipe carried into Foundry Street from the Sheffield Road was a service-pipe and not a main; and therefore the Board were quite within their right.

These are the simple facts. The Board have succeeded; but, as we have said, there is a feeling of some sympathy with the plaintiffs. The consumer in question was, for the Company, a very desirable one—more so to them probably than to the Chesterfield Board. The Court determining in favour of the Board by placing the pipe in question in the category for which they contended, leaves the position a most unsatisfactory one for the Company; and the matter, even from the legal point of view, seems still open to some doubt. His Lordship held that the pipe, being only small in diameter, and running from the Sheffield Road main for the supply of a single consumer, was a service-pipe; but, if the pipe were tapped for the supply of other consumers in Foundry Street, it would be converted into a main. His Lordship took Lord Selborne's interpretation of the terms "mains" and "service-pipes" in the case of *Milnes v. Mayor of Huddersfield*—"mains" being construed to be that part of a distribution system by which the commodity is brought into a street from the source of supply; and "service-pipes" being that part of the system by which the commodity is conveyed from those mains to the individual consumers. On this interpretation alone, it could be contended that the 2-inch pipe laid in Foundry Street was the part of the distribution system by which gas was "brought " into" the street; and therefore the pipe, with all deference to his Lordship's judgment, would appeal to us as being something more than a service-pipe. It is all a matter of the true meaning of terms. It is customary in gas and water supply to regard the pipe conveying gas or water in the street as the main, and the pipes running laterally from

it to the houses bordering the street as the service-pipes—branch pipes into other streets being also mains. The foundry in question does not border on the Sheffield Road, but is up another street running off the Sheffield Road, which fact in itself, to our minds, creates a distinction.

There is a further point bearing on the question of construction. Can a pipe be considered a service-pipe that is of extraordinary length? After this case, it seems to us the maximum length of a pipe that shall be called a "service-" pipe" requires defining. By the Gas-Works Clauses Act of 1871, the Legislature appears to have been very close to defining, if they did not actually define, the maximum length of a service-pipe. Clause 11 says: "The undertakers shall "upon being required so to do by the owner or occupier of "any premises situate *within twenty-five yards* from any "main of the undertakers, or such other distance as may "be prescribed," &c. Then follow the conditions as to payment for excess distances over 30 feet, and other matters. The Legislature therefore did recognize the reasonableness of naming some limit, and did not contemplate compulsory service to any premises situated at a greater distance than 25 yards from a main; and, for any distance that a service-pipe was laid over 30 feet, the owner or occupier could be called upon for payment. But this foundry was 88 yards away from the Sheffield Road main, which distance in all conscience is an extraordinary length for that which we are accustomed to call a service-pipe.

As we have said, the position is a most unsatisfactory one in the circumstances of the Whittington Company, though we do not for one moment suppose the Chesterfield Board will take any undue advantage of the open ground that the judgment gives them. Under the decision, it would be quite possible for them to supply every house in Foundry Street, if worth while, by taking a separate small diameter pipe to each one from the Sheffield Road main, though such a mode of procedure would be an abuse of engineering practice. If, too, 88 yards of 2-inch pipe running up a street hitherto unsupplied by the Boaid is a service-pipe (as the Court holds it is), then who is to deny to the Board the right to pick out the very best consumer farther away in the Whittington Company's area (if there is one customer worth having more than any others), run to him a 2-inch pipe from the Sheffield Road main, and call it a service-pipe. According to Mr. Justice Eve, it would be a service-pipe in the eyes of the law so long as no other pipe was taken off it. What it would be called in engineering practice would not be "service-pipe." Yet, with Mr. Justice Eve's decision in their favour, what is there to prevent the Board doing this?

A Tar Committee.

THE proposal made by the "Iron and Coal Trades Review" for the formation of a Committee to look after the interests of tar, tar products, and benzol in like manner to the Committee devoted to sulphate of ammonia is of interest. But it seems to us to be surrounded by many difficulties, mainly due to conflicting interests; and it is doubtful whether a Committee of the kind would serve any really useful end. The positions of tar and of sulphate of ammonia are not actually analogous. Tar has not competitors of the same rank as nitrate of soda and other artificial fertilizers with which sulphate of ammonia has to contend in the markets of the world. That is the first point which draws a distinction between the two, and that is the basic reason why, for the development of markets for tar and its derivatives, there is no particular call for propaganda work. The fact that the price of tar is what it is to-day—a price that compares well with the time (before the advent of road-tarring) when the distillers gave what figure they liked for tar, and the only alternatives were to use it for boiler-firing or furnace-heating—tells its own story. Furthermore, the producers of tar who do not distil are not limited to-day to the market provided by the tar distiller; the tar distiller devoutly wishes that they were. Therefore we cannot see that the case for propaganda is at the present time a very strong one.

The question of prices is a more difficult one. The trouble that we have had to obtain really representative values that could be accepted by all discloses the sensitiveness and the secretiveness or reticence of both buyers and sellers, as well as studied interest on the part of those whose position in commercial dealings is midway between the two. A Committee might do some useful work in the direction of obtaining and publishing reliable prices, as well as in the accumulation of production, demand, stock, and other statistics. But is an *ad hoc* Committee required for such a limited purpose? The tar producers are the producers of sulphate of ammonia; and why therefore should not the Sulphate of Ammonia Committee, having all the machinery at hand, extend their functions and revenue by taking up this matter of rendering assistance to the tar trade? We submit this as a question for consideration without consultation with anyone connected with the Sulphate of Ammonia Committee. There may be reasons which we cannot at the moment see against taking up the dual work by the Committee; but if there are, we have not detected them. So far as the tar trade of the gas industry is concerned, the Commercial Sections of the District Associations have their hands pretty well upon the statistical position; but, of course, they are not able to obtain complete records, owing to the coke-oven owners being outside their ranks. The Sulphate of Ammonia Committee, on the other hand, have in their membership producers of sulphate of ammonia from all the carbonizing industries, though even that Committee have not secured representation as subscribers for the whole of the production—the deficiency being about one-third. But the Committee being in existence, it seems a pity, if they could cope with the work suggested by the "Iron and "Coal Trades Review," and such work would be useful, to further enlarge the number of separate bodies. It is difficult enough now to get full representation in all those already in existence, and to secure adequate finances for carrying on their work to the fullest possible extent.

Next Year's Meeting of the American Gas Institute.

We learn from the "American Gas Institute News" that the Technical Committee is now organized, and has commenced making arrangements for the meeting in New York next year. The recent meeting at Richmond demonstrated the value of the early publication of papers and their presentation in abstract; and the Committee are now asking that, as far as possible, papers should be ready by the 1st of May next. They give a tentative programme which they consider offers to chemists, accountants, and office men an opportunity of discussing subjects of special interest to them. They hope the invitation will result in such a paper list for the Chemical and Commercial Sections that their future performance will be assured. The programme referred to shows that the meeting will open on the 21st of October; that meetings of the various sections—Manufacturing, Chemical, Distribution, and Commercial (Accounting and Office Methods)—will occupy the afternoon of the first day and the whole of the next two days; and that the meeting will close on the morning of the 23rd, and be followed by an outing in the afternoon.

Volatile Constituents of Coal.—This subject is dealt with by Messrs. A. H. Clark and R. V. Wheeler in Part III. of a communication to the "Transactions" of the Chemical Society for the present year (No. 1704). The authors state that coal can be separated into two substances, differing widely in their characteristics, by the solvent action first of pyridine and then of chloroform or benzene. The portion of coal soluble in pyridine appears to consist of the resinous constituents, together with some of the humus substances. The latter are insoluble in chloroform or benzene, whereas the resinous constituents are soluble. A separation can thus be made. Destructive distillation at different temperatures of the separate portions of a bituminous coal obtained by the use of these solvents supports the view already put forward that coal is conglomerated of two types of substances, "hydrogen-yielding" and "paraffin-yielding"—the former being the degradation products of the celluloses (humus substances), part of which are insoluble in pyridine, and part soluble in pyridine but insoluble in chloroform—the latter being the resinous constituents, soluble in both pyridine and chloroform.

"Transactions" of the North British Association.—We have received the report of the proceedings at the fifty-second annual meeting of the North British Association of Gas Managers, held at Greenock on the 4th and 5th of September, under the presidency of Mr. James Macleod, the Corporation Gas Engineer and Manager. The technical matter, including the "William Young Memorial Lecture," on "Possible Economies in Gas Manufacture," by Dr. W. B. Davidson, was given in the "JOURNAL" at the time. It is preceded by the annual report of the Council and the accounts for the year ended June 30 last, and followed by lists of officers and members. The report of the proceedings at the ceremony of unveiling the William Murdoch Memorial Tablet at Lugar on the 26th of July, which appeared in the "JOURNAL" the following Tuesday, is reprinted with due acknowledgment. Appended to the report of the Association proceedings is the "Statistical Report of the Gas Supply of Scotland" for the year ended May 15, published by the Committee. A photograph of the members in a group forms the frontispiece; and there are portraits of the President, the readers of the three papers (Messrs. Halkett, Scott, and Vass), and Dr. Davidson. The book has been produced under the supervision of Mr. Lawrence Hislop, of Uddingston, the Secretary of the Association.

JOHN WILLIAM FIELD.

As we were going to press with the present issue, the information came to hand that, after an illness of some duration, Mr. John William Field, the late Secretary and General Manager of the Gaslight and Coke Company, died on Sunday. His age was 74. Mr. Field was the son of Mr. John Field, the Accountant of the Imperial Gas Company, and the originator, more than forty years ago, of the valuable "Analysis" bearing his name. On the amalgamation of that Company with the Gaslight and Coke Company in 1876, the services of both father and son were transferred. At that time, Mr. John Orwell Phillips was Secretary and General Manager of the Gaslight Company—a position he had filled since 1862. On his retirement in 1893, in consequence of ill-health, Mr. Field succeeded him, and discharged the duties till June, 1903, when he resigned. The offices were then separated; Mr. D. Milne Watson being appointed General Manager, and Mr. H. Rayner being entrusted with the supervision of the secretarial work of the Company. Mr. J. W. Field continued the preparation of the "Analysis" after his father's death in 1886, and effected further improvements in it. The responsibility for its production, however, passed into other capable hands. Of Mr. Field we need only remark, as was said at the time of his retirement in 1903, that his character stood high for integrity and for a concentrated devotion to the interests of the Company. There was not another man in the service, high or low, who worked harder than the head of the staff. He was one of those workers who fall into the error of overtaxing themselves by attempting to keep too much in their own hands. It was not always possible to see eye to eye with Mr. Field in regard to questions of policy. But that is a matter of the long-dead past. The regret that we felt over the cause of his retirement in 1903—failure of health, attributable to over-work—is intensified to-day as we chronicle the close of life, and remember that the latter years were not so reposeful as they would have been had health been unimpaired by a less strenuous existence in the years of best manhood.

PERSONAL.

Mr. FRANK BATT, the Manager and Secretary of the Flint Gas and Water Company, Limited, has tendered his resignation.

Mr. GUY LEMMON, of the Hollingworth Gas-Works, Oldham, has been appointed Manager to the Horsham Gas Company, to fill the vacancy caused by the death of Mr. E. T. D. Sapey.

Mr. EDWIN ALLISON, Assistant-Manager in the Airdrie Corporation Gas Department, has been appointed to a similar position with the Redhill Gas Company, under Mr. W. H. Bennett, the Engineer and Manager. He was a pupil of Mr. J. C. Belton, of Chester. After eighteen months spent with Messrs. G. Waller and Son at Stroud, he was appointed Assistant-Manager to the Londonderry Gas Company; and two years ago he secured his present position at Airdrie. He will start at Redhill on Jan 1.

A canteen of cutlery, subscribed for by the employees of the Wakefield Gas Company, was presented last Thursday evening to Mr. C. V. TOWNSEND, who, as already stated in the "JOURNAL," has been appointed Gas Engineer and Manager to the Hereford Corporation. The presentation was preceded by a tea and entertainment, at which about 120 sat down, provided in the Company's offices by Mr. Harry Townsend, the Managing-Director, who presided. The oldest workman—Mr. George Kemplay, who is upwards of eighty years of age—made the presentation. The best wishes of the recipient's colleagues were expressed for his success in his new sphere. The canteen bore the following inscription: "Presented to Mr. C. V. Townsend by the Employees of the Wakefield Gaslight Company. December, 1913."

OBITUARY.

WE record with regret the death, on Monday morning last week, of Mr. E. T. D. SAPEY, the Engineer, Manager, and Secretary of the Horsham Gas Company. He was taken ill on Thursday week, and hopes were entertained of his recovery; but he had a relapse. He was in his fifty-ninth year, and had been connected with the Gas Company—first as Engineer and Manager, and subsequently as holder of the additional position of Secretary—for about thirty years. He was at one time a member of the Urban District Council, and always took a deep interest in local affairs, as well as in all kinds of sport. He was much respected in Masonic circles. After having been W.M. of Lodge No. 386, he joined the March and Darnley Lodge (No. 1141), and held the rank of Worshipful Master in 1891; while only a fortnight ago he was appointed Provincial Senior Grand Deacon. He was Secretary of the Mark Lodge, Mid-Sussex (No. 449), and was a Past Provincial Grand Registrar of Marks. He will be greatly missed by many who admired his uprightness of character and his genial and happy nature. The funeral took place last Wednesday afternoon, in Hills Cemetery, and was attended by a large number of family and other mourners, including representatives of Masonic bodies. The coffin was borne by four employees of the Company. Mr. Sapey's brother, Mr. W. A. Sapey, is the Engineer, Manager, and Secretary of the Tamworth Gas Company.

JOSEPH BENNET, OF EDINBURGH.

WE regret to record the death last Friday, at his residence, "St. Helier's," Hermitage Drive, Edinburgh, of Mr. Joseph Bennet, of the firm of Messrs. Alder and Mackay, gas-meter manufacturers, New Grange Works, Edinburgh. He had been ailing for some time, and for the last three weeks his condition became precarious.

Deceased was born in 1836 within sound of the clock chime of the Canongate Tolbooth, in the very heart of Old Edinburgh, and he was a resident within the boundaries of his native city all his days. He began life as a practical tinsmith, and was proud of his craft. Entering the business of Messrs. Alder and Mackay, a partnership with Mr. Alex. Mackay soon presented itself, and it remained unbroken for more than forty years. From small beginnings, they saw the business develop under his skill and industry until the manufactory became one of the foremost in the United Kingdom. He never retired, and maintained almost to the end personal daily supervision of some of the more important details. Age and experience entitled him to be looked up to as the father of his trade, not only of this country, but probably of the wide world.

Mr. Bennet was a man of strong individuality, of undaunted uprightness, and sterling character; and he commanded the respect of all who came in contact with him. He was an ardent churchman, and with him originated the scheme for building the United Free Church of Greenbank, Edinburgh, and for the successful gathering together of the present congregation there. Many mourn his loss as one who went about doing good in his own quiet, unostentatious manner. He was fond of travelling, and had visited most of the countries on the Continent, as well as Canada and the United States. It was during one of his recent trips abroad that he met with an accident to the spine which caused the extreme debility resulting in his death.

It may be mentioned that he and Mrs. Bennet celebrated their golden wedding on Jan. 1, 1912; and they both entered into the festivities with great pride and satisfaction. Deceased is survived by his widow, a son, and three daughters.

ELECTRICITY SUPPLY MEMORANDA.

STREET lighting is a topic that somehow contrives to put an amount of animation into the lives of technical journalists associated with both the gas and electricity industries. To the joys flowing from keen street-lighting competition, there was a contribution last week from Islington. We congratulate the Borough Council upon the sense of fairness they displayed in dealing with the matter. It seems to be an extremely difficult thing in many places where the local authorities direct the fortunes of the electric-lighting undertakings for the gas companies to get fair treatment in respect of street-lighting business. The possession of the electricity supply has in several towns completely buried in this connection the good old rule as to the public requirements being put up to free competition and being the subject of tender, with the award of the business where best value is to be obtained for the money expended. Hence injustice to both ratepayers and gas-suppliers, who are also very large and old ratepayers. However, the Islington, Borough Council, owners of the local electricity undertaking (as was seen from the report in our columns last week) have dealt with a proposal for an improved scheme of lighting at a cheaper rate with a fairness that should be acknowledged, and which incidentally shows that, at the price at which the inverted gas-lamp can be applied to street lighting, electricity cannot commercially compete, as it cannot compete on points of quality, reliability, and uniformity of distribution. Profiting by their experience in Holborn, the Gaslight and Coke Company, in offering Islington improved lighting at a lower cost, asked that the envelope containing their scheme and costs should not be opened until after a scheme in preparation by the Electrical Engineer had been submitted. This was only a fair request; and the Lighting Committee honourably complied with it. How often the Electrical Engineer between the receipt of the gas scheme last January and when he submitted his in October, must have wondered what that sealed envelope from Horseferry Road contained. After his report had been made, and when the seal of the Gas Company's offer could be broken, it was found that there was in it for the ratepayers economy with more light in the streets at present illuminated by gas, and in which streets the ratepayers have not suffered from light extinc--but, there, we will not link-up such things with congratulation on a just policy.

A Fair Compact at Islington.

The main thing is that the Gaslight and Coke Company secure a new contract for five years, and have made a tempting offer for the following five years; and Alderman Vorley, the Chairman of the Lighting Committee, says the price for the value to be given will make it hard for electricity to compete in future. The contract covers 3917 street lamps;

The Inverted Lamp Scores.

and on the first five years, the saving per annum will be £3300, while the amount of light in the streets covered will be augmented by 33 per cent. The old contract is to be cancelled, and the new one entered upon as early as possible. The only condition against the Company (if "against" is a correct word under the circumstances) is that the Council are to be at liberty to convert any number of the lamps out of the odd 917 (if they so desire), but they are not to reduce the number below a minimum of 3000. If the Council exercise this right, then under a sliding-scale up goes the price for the remainder of the gas-lamps. What has enabled this great saving to be offered to Islington, with a one-third increase in the illuminating power? Simply the conversion of the lamps from the vertical incandescent form to the inverted form. The higher efficiency and the reduced mantle consumption, with the lower net cost of gas than ruled a few years ago, all enable the Company to scatter benefits, while retaining the business; and they see their way to increasing the saving five years hence. With the economy the Gas Company are effecting for the borough in the first quinquennium, the whole cost of lighting the streets will amount to £23,000 per annum; so that it is seen that the Electricity Department will be taking £13,700 per annum, as against the Gas Company's £9300, while the former have only 650 flame arcs and 65 metallic filament lamps, as compared with the Gas Company's 3917 lamps over a considerable mileage of thoroughfares. The aggregate candle power of the electric lamps is stated to be 1,304,290, which we calculate gives an average of somewhere about 2000-candle power per flame arc lamp. Is this really so?

Insulation Problems.

What with loss of life, the burning of property, shocks to the individual, and heavy losses of energy in distribution, there is abundant evidence of the fact that the electrical engineer has not yet realized the perfect insulation for his cables and wires that he would like to obtain, and hopes are not great that he will ever do so. The problems, in fact, seem to be insurmountable, according to a paper read by Mr. Sydney Evershed before the Institution of Electrical Engineers, on the "Characteristics of Insulation Resistances." Insulating materials are like a few others of which we know. In the laboratory, their behaviour may be exemplary; but when let loose from the laboratory, and taking their place under ordinary everyday conditions, then their behaviour may be quite the reverse. The vagaries of insulating material are almost the equal of the vagaries of the electric current. The difficulties in ordinary use mainly arise from the presence of moisture. Therefore a non-absorbent material is required; but a non-absorbent material may be very treacherous in other respects. It may contribute to the world's supply of gas, and a very inflammable and sensitive gas it is. In wet weather, or at any time when there is a great deal of humidity about, insulation resistance decreases; and it only recovers its normal condition during dry weather. In most cases, too, insulation resistance decreases almost instantaneously as the electrical pressure increases, and only slowly recovers when the pressure is restored to the initial value, or is altogether cut off. But to return to damp days (of which we get a large number in these years of grace, much to the distress of the engineers responsible for electricity distribution), there appears to be some sort of collusion between them and the insulating material in respect of the formation of moisture films on the external and internal surfaces of the latter; and these films supply the paths of leakage. What with the attacks of atmospheric conditions on the insulating material, the effects of pressure rises upon it, and the general depreciation that is ever going on, and so increases the risk of trouble, the electrical engineer has to keep a sharp look-out. But sharp as he may be, trouble comes, and oftentimes at the most unexpected place. It is not considered possible, even by systematic insulation testing, to forestall breakdowns—in fact, the whole problem, it is confessed, is well-nigh insoluble. The gas engineer can sympathize, but he cannot render help, though reliability of supply is one of his strong business points.

Brotherly Love.

In an article on "Advertising Efficiency" in the "Electrical Times," Mr. Basil Barham strings together some thoughts of his own and of other people, with the view of stimulating a greater interest in publicity work on the part of the electrical industry. Among other points, he says that arrangements have in certain localities been made with newspapers to the effect that, whenever in the ordinary news columns a notice appears regarding fire, explosion, or loss of life, due to gas, immediately underneath a small advertisement is to be placed calling attention to the advantages electricity possesses, or (to put it a little more truthfully) is represented to possess by purveyors of electricity, on the score of safety. This is much like the insurance-against-burglary advertisements that appear in some papers under the records of nocturnal visitations, and like the insurance-against-accident advertisements that appear under accounts of motor accidents. How would Mr. Barham like to see succeeding those evidences of the electrical attempt to profit at the expense of the unsophisticated a little list of some of the incidents in which electricity has taken a leading part, and which have meant a fearful loss of life and a tremendous sacrifice of property? The major part of the public must laugh at the serious way in which electrical folk seek to bamboozle it.

Wall and Rail.

On the subject of fire, "Meteor" is furious, because the British Fire Prevention Committee, in their benevolent desire to assist in preventing the darkening of doors at Christmas time, have issued their annual warning, with a sprinkling of red ink in it, about (among other things) the dangers of electric wiring in proximity to decorations. There is always a risk about electric wiring; there is a greater risk in the temporary installation that threads its way among the inflammable accompaniments of Christmas time. "Meteor" knows of the danger, but belittles it. He could, if he cared, recall various instances of Christmas tragedy and destruction of property. But there is a game to play; and an assumption of ignorance or pretence has a forward part in it. The lumps of sarcasm that he hurls at the devoted heads of the Fire Prevention Committee are exemplified by this: "Is this a case of distorted sense of perspective, or is it a too obsequious regard of potent interests?" The "potent interests" are constituted of the gas industry; and the chagrin is great because "gas obtains exactly one word in small print," while electricity receives a displayed title and large type, which is a very proper thing. Our friend thinks the action of the Committee insidious; it cannot be more so than the fire-raising propensities of electricity.

Fires in Germany.

We unhesitatingly accept the following from the "Electrical Review" without comment or question: "The seventeen companies forming the Union of Private Fire Insurance Companies (Verband der Privat Feuer Versicherungs Gesellschaften) have for a number of years past made a practice of collecting statistics respecting the damages alleged to be caused through electrical installations. According to the Union's report for 1912, there were 483 fires, compared with 482 in the preceding year; and the compensation paid amounted to £59,900 and £54,100 in the two years respectively. Out of the total number of cases of fire, 231 were proved to have been due to short-circuits, and 139 cases were presumed to have arisen from the same cause, and most of the fires (206) occurred in dwelling houses, villas, &c."

Electricity, Ventilation, and Voltage.

Olympia is electrically lighted under contract with the Hammersmith Borough Council, who are very jealous of their rights in this regard. The "Motor" on the 2nd inst. contained this paragraph: "There was a distinct improvement in the ventilation at Olympia from Wednesday. At midnight on Tuesday, a shift of men stripped the glass sashes on the roof, and put up a scientific system of suction shafts." This reminds one of the lecture theatre of the Institution of Electrical Engineers. The "Electrical Times" has been making another attack on the lighting of the theatre. The Council of the Institution seem to enjoy these attacks, for they show no particular desire to mend matters. Perhaps there is a more material reason—funds may be low. The paragraph before us reminds that the members do not like the indirect lighting of the theatre, any more than they do its stagnant air when numbers of them are assembled there. This is what our vivacious friend "Meteor" says: "It seems that irregularity in the pressure of supply has to be added to the permanent defects already sufficiently notorious; and the result is that, on the whole, we have the worst lighted lecture theatre in London. More than once, when Mr. Sydney Evershed was giving his charming demonstration on insulation phenomena, a swiftly gathering gloom descended upon his audience. Anon, the sun came out once more; all Nature was gay—as far as could be seen along the cornices—and the audience cheered up until the next bank of clouds arrived to make them as sombre as an early Victorian family at prayers on a foggy evening."

American Gas Institute and the Photometrical Commission.—At the first meeting of the newly-elected Board of Directors of the American Gas Institute, Mr. Alten S. Miller, who represented the Institute at the meeting in Berlin last June when the Photometric Commission was terminated, and in its place the International Commission on Illumination was organized, made a verbal report, and handed over to the Institute documents, reports, &c., which will form the basis of a formal report to be published in the volume of "Proceedings." The constitution of the Commission adopted was ratified, and $100 were appropriated for the current year as the Institute's contribution. Mr. Miller was appointed the third representative of the Institute on the Commission.

The World's Coal Supply.—At a meeting of the Manchester Geographical and Mining Society last Tuesday, Sir Thomas H. Holland said the total coal resources of the world were estimated at 7½ billion tons. The possible total resources for the five continents were: Oceania, 170,000 million tons; Asia, 1¼ billion tons; Africa, 57,000 million tons; America, 5 billion tons; Europe, 764,000 million tons. Out of a possible estimated resource of 189,000 million tons of coal in the United Kingdom, it was estimated that the actual coal reserve was 141,000 million tons. Germany's actual figure was 104,000 million tons; and the estimated possible figure, 319,000 millions. Judging by the total of upwards of 7 billion tons, and the fact that the annual production is still under 12,000 millions, Sir Thomas thought there was no immediate fear of a general exhaustion in the coal supply.

NATIONAL ILLUMINATION COMMITTEE OF GREAT BRITAIN.

A Provisional Committee, formed of representatives of the Institution of Gas Engineers, the Illuminating Engineering Society, the Institution of Electrical Engineers, and the National Physical Laboratory, held a meeting on the 29th ult., at which arrangements were made for the formation of a National Illumination Committee, to be constituted according to the statutes of the International Illumination Commission, with the primary object of affiliating Great Britain to that Commission.

The Provisional Committee recommended that the National Committee should consist of five representatives of each of the three Technical Societies and two representatives of the National Physical Laboratory. This recommendation has been adopted, and the following have been nominated as members of the Committee: By the Institution of Gas Engineers: Mr. Edward Allen, Mr. John Bond, Mr. W. J. Atkinson Butterfield, Dr. Harold G. Colman, and Mr. Robert Watson; by the Illuminating Engineering Society: Mr. F. W. Goodenough, Professor Silvanus P. Thompson, Mr. L. Gaster, and Mr. A. P. Trotter (this Society has not yet nominated its fifth representative); by the Institution of Electrical Engineers: Mr. F. Bailey, Mr. W. Duddell, Mr. Kenelm Edgcumbe, Mr. Haydn Harrison, and Professor J. T. Morris; and by the National Physical Laboratory: Dr. R. T. Glazebrook, C.B., and Mr. C. C. Paterson.

The first meeting of the National Committee took place on Tuesday, the 2nd inst., when the following were chosen as officers: Chairman, Mr. E. Allen, of Liverpool; Vice-Chairmen, Mr. W. Duddell and Mr. A. P. Trotter; Honorary Secretary and Treasurer, Mr. W. J. A. Butterfield. Great Britain is entitled to two delegates on the Executive Committee of the International Illumination Commission; and Dr. Colman and Mr. Duddell were accordingly appointed by the Committee as the delegates from this country.

WORKS TOPICS—XI.

By Modus Operandi.

It has not before been possible to comment upon Mr. Doran's paper, on the "Purification of Coal Gas," read before the Scottish Junior Gas Association on Nov. 22 [see "Journal" for Nov. 25, p. 683]. Reference would not now be made were it not for a few extraordinary opinions expressed by the author. These are so contrary to general experience that they call for comment.

The author states that "the purifiers themselves are of two main styles of construction—water-lute and luteless or dry lute. Both have their own particular advantages; but, on the whole, the old water-lute type is to be preferred. One great merit is that the water-seal acts as a most efficient safety valve for practically the entire works—a fact which, I think, is sometimes overlooked." It is earnestly to be hoped that it will continue to be overlooked, for a more dangerous doctrine could hardly be preached. Surely the last place that one would wish to fit a safety valve of this description would be in the purifying-house. If the author is referring to uncovered purifiers, he should have made this clear; for throughout the country there are scores of brick-built purifying-houses, where an escape of gas is a source of great danger. The manager of works where such purifying-houses, fitted with water-lute purifiers, are in daily use is to be pitied—not congratulated. In such cases, the usual and proper practice is to fit a safety water-seal in the open, so arranged that it will blow off before there is any possibility of the blowing of a purifier seal. Even then the use of water seals in closed purifying-houses is greatly to be deprecated, for the water lutes may leak and become unsealed, and thus cause a serious accumulation of gas.

Revivification "in Situ."

Later in the same paper, the author condemns the use of grids and, incidentally, the system of revivification *in situ* on quite exceptional grounds; for, as he puts it, "if revivification *in situ* is practised, the heat generated by the chemical reaction of the oxygen with the ferrous sulphide will be so great as to often char the grids, and may quite easily set them on fire—thus necessitating expensive renewal, and, further, in the case of the oxide working actively, charring may again occur, rendering the grids useless and greatly increasing the dangers of the purifier-house." Thus the author condemns the use of grids by those who revivify *in situ*, for the reason that the grids may be burnt. If such a thing were to happen, the fact that the grids would have to be renewed would be of very little consequence compared to the other, and serious, damage that would be done. Any of the many engineers who are working on the backward rotation system—which is revivification *in situ*—would dispute the fact that there is any extra danger of the oxide firing in a purifier when at work because revivification *in situ* is practised. For such a catastrophe to occur, the oxygen content in the gas would have to be exceedingly high. This being so, the small quantity purposely admitted for internal revivification purposes would be infinitesimal compared with the remainder in the gas.

Admission of Air.

To revivify *in situ*, it is only necessary to use from 1½ to 3 per cent. of air, according to the amount of SH_2, which will usually be present to the extent of from 350 to 700 grains per 100 cubic feet of coal gas. This does not mean to say that this quantity of air must always be purposely admitted; for, as a matter of fact, the gas will always be found to contain a proportion of oxygen. Now 1½ to 3 per cent. of air is equivalent to about 0·3 to 0·6 per cent. of oxygen respectively; and, as a good proportion of the latter will be present in the gas even if no air is purposely admitted, it is usually necessary to admit much less than the quantity of air already mentioned. Consequently, the necessity of testing the gas for oxygen, before blindly admitting air for revivification *in situ*, cannot be too strongly emphasized. In fact, in many works it will be found that there is sufficient oxygen in the gas to effect the whole of the revivification *in situ* without purposely admitting any air at all. This being so, it is far from right to condemn the practice of revivifying *in situ* because of the amount of nitrogen contained in the air admitted. The admission of nitrogen is, of course, a disadvantage; but is a small one compared with the advantages of revivification *in situ*.

The idea of giving up grids because one may burn them is, to say the least, an extraordinary reason for discarding them. In mentioning "revivification *in situ*," the author may possibly have been referring to that dangerous practice of blowing air through a purifier when shut off. If so, he should have made it clear, as this term—revivification *in situ*—is understood by most engineers to be the internal revivification obtained by working purifiers on the reverse action, or backward rotation, system.

Extraction of Cyanogen—Williams's Process.

Brief mention is made of the extraction of cyanogen. Mr Doran says that "the general trend of opinion at present is rather against this particular branch of purification, on account of the many difficulties it presents and the somewhat doubtful nature of the profits to be derived." He also adds that "it is only on very large works that it can be carried out."

If, however, Mr. Doran will refer to Mr. Broadberry's paper, on the "Recovery of Cyanogen," in which was described the Williams process [see "Journal" Oct. 1, 1912, p. 31], he will find that there *is* a process which presents but few difficulties in working. Here was explained a system which is cheap to instal, easy to work, and thoroughly efficient. It was, further, shown to be suitable for all but the smallest of works. That this is so is evident, for Dr. Harold G. Colman, in discussing the paper, stated that "he had had the opportunity of seeing the process several times during the past two years, and it certainly worked remarkably well. It was simple and easy; and the amount of supervision required must be extremely small." Later on, the same speaker also remarked that "hitherto it had not been possible for small works, in most cases, to adopt the process, owing to the expense being too great; but now, provided they could get a market for the product, this very simple and easy process was almost as equally applicable for small works (when the conditions were suitable) as for large ones."

As to the profit to be made from such a process there is admittedly an element of doubt. Market conditions, which are not improving, and the situation of gas-works, owing to the expense of carriage, complicates any estimate as to the profit obtainable.

At the first opportunity, a more extended reference will be made to this interesting process.

Fire-Damp as a Fuel.—In the course of a discussion on a paper on "Fire-Damp in Coal Mines" at the meeting of the Manchester Geographical and Mining Society last Tuesday, Dr. Harger said that by collecting the fire-damp in concentrated form it would, instead of being regarded as a danger and a nuisance, at once become a very valuable asset. As an example, it was stated that a mine in Yorkshire gives off every 24 hours 4 million cubic feet of fire-damp—sufficient to supply several large towns with gas. This, he thought, was a striking illustration; but he ventured to put it in a more practical manner, thus: The 4 million cubic feet of gas weigh about 82 tons; and taking into consideration the more complete combustion possible with gas for heating, it is equivalent to 150 tons of the best bituminous coal, and if used direct in gas-engines it is equivalent for power to 200 or 250 tons of coal a day, or nearly 100,000 tons per annum.

Cyanogen Sludge.—The number of "Feuerungstechnik" for Dec. 1 contains information on a system which is being tried at Neukölln for the treatment of this residual of gas manufacture. The washing of the gas with ferrous sulphate results in a sludge containing valuable constituents, including ammonia and prussian blue. The Municipality of Neukölln have discovered that there are many disadvantages attached to the present method of disposing of their sludge, which is sold to a chemical firm. Only the ammonia is paid for, and this at a much lower rate than that contained in concentrated liquor. Then there are few firms which are able to deal with the product; and its high water-content renders transport rather costly. Other firms, again, pay well for the prussian blue, but take no count of the ammonia. Dr. Funk, the Municipal Chemist, has been working at a process which aims at breaking the sludge up into its two chief components, so that they can be advantageously sold in the form of workable compounds. The process is already on trial, and, if successful, will be tested on a large scale at Neukölln.

HUMPHREY FITTINGS AND BURNERS IN A REMARKABLE LIGHTING INSTALLATION.

We have recently been drawing special attention to the need in gas-lighting installations for greater attention to the decorative side, which is the side towards which competition demands that the gas industry shall steer. Some splendid photographs illustrating an installation of lighting that possesses the three points of utility, decorativeness, and attractiveness have reached us from America. It is part only of the enterprise of the Laclede Gas Company; and the work of installation and fittings design is due to the Company with which the well-known Humphrey lamp and other lighting specialities are identified, and for which Mr. Herbert N. Clark, of 28, Brooke Street, Holborn, E.C., is the British representative. The following description is reprinted from an American publication, the "Gas Arc."

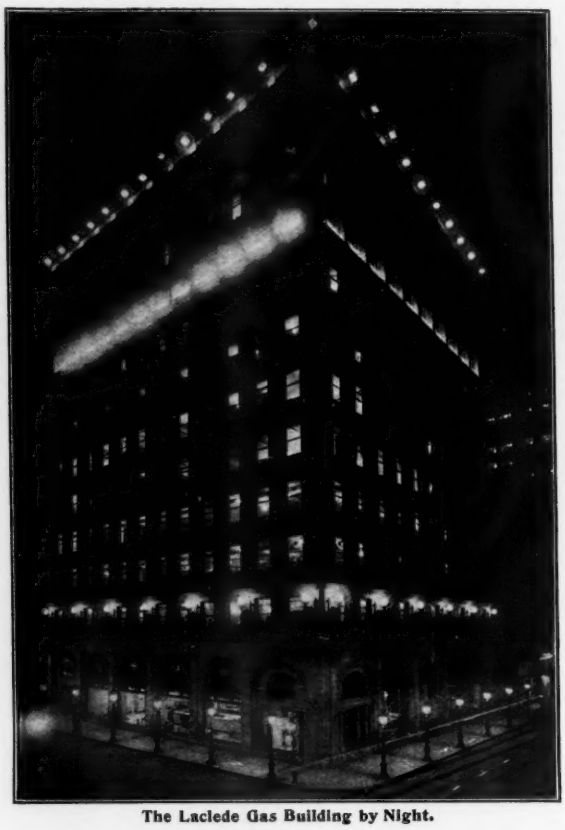
A visit to the Laclede Gas Lighting Company's magnificent new office building in St. Louis will put fresh enthusiasm into any gas man, and amaze even the most progressive, in its demonstration of the possibilities of modern gas lighting. The building is a perfect fairyland of light, both inside and out. The fixtures are of entirely new types, but all absolutely practical and adaptable to regular commercial work.

The Laclede Gas Building is an imposing structure, ten stories and basement, and probably the largest in the country devoted entirely to the gas business. About one-third of the space is required for the Laclede Gaslight Company's offices and salesrooms, and the balance found ready tenants in the gas supply firms recognizing St. Louis's supremacy as the headquarters for south-western trade.

Being the official centre of the gas industry, it is wholly appropriate that it should be a permanent exhibit of the best ideas in gas lighting. Mr. Charles L. Holman, the President and General Manager of the Laclede Company, took this view from the outset; and he further insisted that all artistic design must be combined with practical burner construction insuring commercially adaptable fixtures that might also be used in extending the general gas lighting business of the Company in St. Louis. This proved very effective in squelching freak design and lighting stunts that are out of the question in regular service for consumers.

The designing and production of the special lighting fixtures was turned over to the General Gaslight Company; and Mr. James M. Coles as consulting expert was put in charge of the work, to study out the requirements and submit designs. Humphrey standardized burner construction was promptly decided to meet all the lighting demands both in illuminating power and ease of control—thus reducing the problem to one of combining proper units and attractively housing them.

The skill with which Mr. Coles developed his assignment is now in unmistakable evidence; and the entire lighting scheme and its arrangement have been most enthusiastically accepted, and found to be perfect, complete, and beyond all expectation. The fixtures are made of solid bronze, artistic in appearance, and, as previously stated, house standard commercial types of the Humphrey arc-burner construction. The indirect system of lighting has been used with wonderfully successful results.



The Laclede Gas Building by Night.

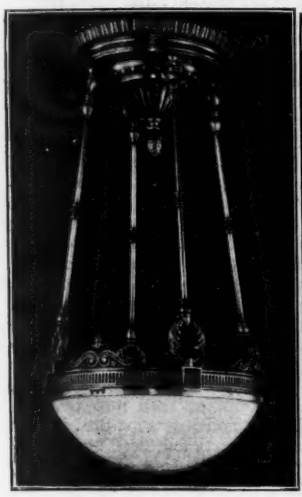
As will be seen from the photographs, the old ideas of gas lighting have been entirely broken away from, especially in the direct fixtures. The final effects of the combined lighting is beautiful, absolutely shadowless, and of an intensity of about six-foot candles at the floor level.

The view of the main office gives a good general idea of the scheme of lighting. There are three distinct systems employed

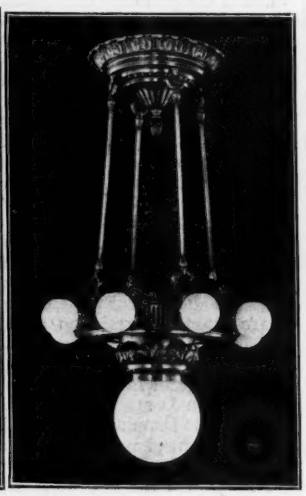
MAIN FLOOR OF THE LACLEDE GAS OFFICES—SHOWING THE CHANDELIERS AND BRACKET FIXTURES.

on this floor. First of all there are the large chandeliers, twelve in number, suspended from the ceiling, each having one large direct inverted unit and eight smaller lamps circled about it. All are operated with a distance-control by simply turning on the gas. These lamps will do the main lighting.

On each of the six large columns are four brackets with 14-inch Persian etched bowls, each having two upright mantles on a



Semi-Indirect Central Light.



Lamp Cluster in Main Floor Office.

Laclede Gas Company's Fittings.

Humphrey upright lamp body—there being sufficient candle power in this system alone to adequately light the room.

Finally there are twenty-eight indirect fixtures with 14-inch Persian etched bowls placed around beneath the mezzanine floor and five other semi-indirect fixtures with 18-inch Persian bowls at the street entrance. All these lamps are lighted and extinguished in series by remote control.

As one approaches the Laclede Building at night unmistakable evidence of the Gas Company's pre-eminence in lighting is flashed forth from scores of lamps illuminating the exterior. Humphrey outdoor arcs carried on brackets at the top are conveniently handled from the roof. The post lanterns on the side walks all carry regular Humphrey "No. 50" gas-lamps set within special casings and mounted on massive posts. Intermediate light belts are electrically illuminated.

Just within the main entrance is the elevator corridor, indirectly lighted with the same style of fixtures used beneath the mezzanine of the general office room. The upper hall ways are all lighted with Humphrey ball arcs of standard type, controlled in series of five lamps pneumatically operated.

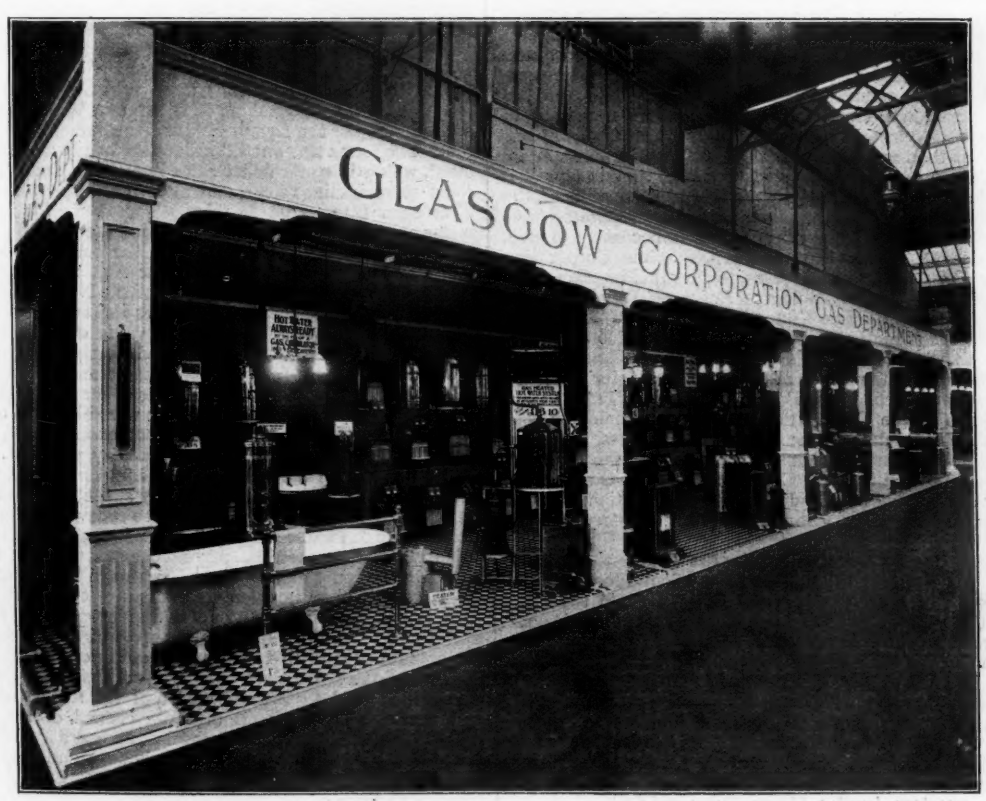
The appliance sales room is in the basement. Here Humphrey ball lamps directly connected with 2-inch iron flues forming part of the ventilating system act as ceiling lights. The effect is fine, and the air is kept pure and sweet by the steady exhaust action of the lamps. That the future will see more and more general adoption of this simple aid to ventilation is not so much a prophecy as simple recognition of the fact that the American people are quick to avail themselves of improvements once brought to their attention.

Undoubtedly, though, the most practically interesting feature in the entire building is the semi-indirect lighting arranged in the accounting room. The order called for soft, restful illumination of ample power for exact book-keeping work; and the regular Humphrey semi-indirect "No. 30" lamp has met the requirement perfectly. In fact, so satisfactory was the initial showing in the Laclede Gas Company's offices that it was decided to use the same system throughout all the rented office rooms. All the tenants are profuse in praise of their lighting, and the building management fully expects to have no difficulty whatever in holding the entire lighting of the extensive building almost exclusively to gas.

The annual gas shows come and go, all exhibiting to a greater or less extent spectacular features of questionable practicability; but in the Laclede Building will be found another of the permanent exhibits of gas lighting as it should be done which the metropolitan companies are now undertaking more and more, to the lasting benefit of the entire industry.

President C. L. Holman and his worthy aid, Mr. A. E. Garvin, certainly merit the words of sincere congratulation which all visitors are so spontaneously offering.

GAS PUBLICITY WORK IN GLASGOW.



[*Photo. by W. Fullerton.*

THE GLASGOW CORPORATION GAS DEPARTMENT STALL AT THE WOMAN'S WORK EXHIBITION.

In assisting the forward movement of smoke abatement, the Glasgow Corporation Gas Department has been, and is, of powerful influence in bringing about the evident change of the spirit for "all things pure." In its missionary enterprise, the department has always shown commendable enthusiasm by bringing to the notice of the outlying consumers the benefits and

economy of gas appliances for all domestic purposes, by holding exhibitions and demonstrations—and with happy results.

At the Women's Work Exhibition and Sale of Art and Craft Industries, now being held in Glasgow, the Corporation have an exhibition of cooking, lighting, heating, and other gas appliances. The stall (the largest in the exhibition) is 60 feet by 12 feet, and is a compact and comprehensive display, embracing all the latest developments and improvements. Utility is the first motive with all gas appliances; and the large crowds that flock to the stall see much to interest them. There is a praiseworthy array of gas-fires in plain and art colours, and, as a heating agency, gas steam-heated radiators are also in evidence. Hot-water circulators for domestic and commercial purposes are seen in constant operation; also towel rails. A ventilating fan, suitable for shop windows, smoke rooms, &c., run at a cost of 1d. for gas for twenty hours, laundry irons that consume a pennyworth of gas in eight hours, and other useful articles attract much attention.

The lighting is also a prominent feature, and the inverted pendants tell their own story. There is also an effective installation of high-pressure lighting, the compressor for which is driven by a small gas-engine of 1½ H.P.; the whole resting on a bed-plate 3 feet by 2 feet. The steady clear light, resembling daylight, from the overhead lamps is the subject of very general admiration, and of numerous inquiries. The cookery demonstrations by two lady assistants of the staff are engrossing and edifying; and, long before they begin, every available inch of accommodation is occupied by interested ladies, who have been heard to remark "this is the most womanly part of the exhibition." The demonstrators prove the value of the gas cooker to every household by cooking edibles suitable for invalids and for the healthy.

The entire display appeals to all sections of the community, the artizan and the merchant prince being alike catered for. The Glasgow Corporation Gas Department deserve all praise for the good work undertaken, with special mention of Mr. Ralph Halkett, the Commercial Superintendent.

WATER LEGISLATION FOR 1913.

[Second Article.]

In the last number of the "Journal," the Acts obtained by companies conferring powers in connection with water supply were noticed. We now deal with the local authorities' measures containing provisions bearing on this branch of the public service.

The Aberystwyth Corporation have been granted an extension of their limits of water supply so as to include certain parishes specified, and also authority to construct new works, comprising an aqueduct, conduit, or pipe-line commencing in the existing reservoir of the Corporation in the parish of Trefeirig, in the county of Cardigan, and terminating by a junction with the water-main near the old reservoir in the parish of Isa'ndre. Ten years are allowed for the completion of these works. It is provided that the Corporation are not to be compelled to furnish a supply of water for domestic purposes for any less sum than 8s. 8d. in any one year, or 4s. less than was stated in the Bill. The Corporation are empowered to supply water by measure; and they may sell it in bulk. They have obtained power, with the sanction of the Local Government Board, at any time to increase the water-rates leviable, by such amount as may be considered necessary to meet the estimated expenditure of the undertaking. The Corporation may borrow £28,500 for water-works, to be repaid within forty years. [*Parliamentary Agents: Messrs. Baker and Sons.*]

The Barry Urban District Council have been authorized to maintain the works sanctioned by Acts passed in 1886 and 1889, and to supply water in the parishes of Sully, Wenvoe, and Porthkerry, and so much of the parish of St. Andrew's Major as lies to the western side of Dinas Powis Brook, and is not included within the water limits of the Corporation of Cardiff. The other provisions of the Act relate (*inter alia*) to the sale of water by measure and in bulk, and the fixing of the dates for the payment of water-rates. By the Bill, the Council sought power to borrow £127,637 for the purchase of land and the construction of additional works; but they did not obtain it. [*Parliamentary Agents: Messrs. Torr and Co.*]

In a General Powers Act obtained by the Bradford Corporation, authority is given for the construction of additional water-works, consisting of a reservoir on the River Nidd, in the rural district of Pateley Bridge, and two aqueducts or pipe-lines in connection therewith. The water limits of the Corporation now comprise the city and the parishes and places specified in the Act, one of which is Shipley; but it is provided that the Corporation are not to distribute water within the district without the consent of the Urban District Council. Permission is given to borrow £650,000 for the reservoir and works, and £100,000 for the general purposes of the water undertaking. Sixty years are allowed for the repayment of the former amount, and forty years for the latter. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Corporation of Coventry have been granted authority to construct and maintain a service tank adjoining the southern of the two existing reservoirs at Coundon, for which power was obtained in an Act passed in 1907; and they are allowed seven years within which to complete it. An agreement dated Aug. 29, 1912, made between them and the Birmingham Corporation, under which the latter will furnish Coventry with an additional supply of water in accordance with the terms and conditions set out in the schedule to the Act, is confirmed. The period specified is from March 31, 1912, to March 31, 1967. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

A General Act obtained by the Derby Corporation contains a few provisions in regard to water supply. The domestic rates specified in section 30 of the Derby Water-Works Act, 1848, are increased to the extent of 4 per cent. per annum upon the annual value of the premises mentioned in the section; and the Corporation are given authority to make agreements with owners or occupiers within their limits who are not entitled to demand a supply, to extend their mains, and supply the property on terms to be arranged. The other provisions enable the Corporation to lay pipes in streets not dedicated to the public use, to repair communication-pipes, and to fix appliances for the preventing of waste. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

The Ebbw Vale Urban District Council have been granted authority to construct additional water-works, consisting of an intake weir on the Claisfer stream, in the parish of Llangynidr, in the rural district of Crickhowell, in Brecknockshire; an aqueduct or pipe-line (partly constructed) connecting it with the existing Carno filters of the Council; a second intake weir and aqueduct; and a compensation reservoir on the above-named stream. Ten years are allowed for the completion of these works. The Council are granted permission to borrow £83,211 in respect of the works specified, to be repaid within fifty years. [*Parliamentary Agents: Messrs. Martin and Co.*]

In a General Act obtained by the Huddersfield Corporation, confirmation is granted of an agreement entered into between them and the Deanhead Commissioners and others for the transfer of the Deanhead reservoir, and all property acquired and works executed by the Commissioners under their Acts of 1838, 1841, and 1889. On the day of transfer, these Acts will be repealed, except in so far as may be necessary for carrying into effect the winding-up and dissolution of the body acting under them. The Corporation have authority to construct an aqueduct, conduit, or pipe-line from the outlet of the Deanhead reservoir to the existing Corporation reservoir in Lindley. They are given power to borrow £12,580 for the purchase of the Commissioners' undertaking, £3370 for lands for filter-beds and the works authorized by the Act, and £17,800 for the construction of the works—to be repaid respectively within forty-five, sixty, and thirty years from the dates of borrowing. [*Parliamentary Agents: Messrs. Lewin, Gregory, and Anderson.*]

The Leeds Corporation have been granted an extension until Sept. 1, 1926, of the period specified in their Act of 1907 for the completion of the works thereby authorized, and of the period named in the Act for the completion of works authorized by the Act of 1901. They are also empowered to construct two conduits, for the completion of which they are allowed seven years. They may borrow £121,467 for the purchase of lands and easements, and sixty years are granted for its repayment. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, and Co.*]

Authority has been given to the Lymm Urban District Council to purchase the undertaking of the Lymm Water Company, and certain lands of the Lymm Estate Development Company, Limited. The terms and conditions are set out in a scheduled agreement, which is confirmed by the Act. The Council are authorized to maintain, repair, and alter the water-works after they have been transferred to them. The limits for the supply of water are the district of the Council and the parish of Warburton, in the rural district of Bucklow, in the county of Chester. So much of the North Cheshire Water Act, 1864, as includes the parish just named within the limits of the North Cheshire Water Company is repealed. The rates for the supply of water are to be 2d. per week where the rateable value of the dwelling-house or tenement supplied does not exceed £7 per annum; above this sum and less than £30 per annum, not more than 7 per cent.; and above £30, a rate not exceeding 6 per cent. All inns and hotels, whether public or private, the rateable value of which exceeds £5, are to be liable to a rate not exceeding 7½ per cent. of the rateable value, whether this exceeds £30 or not. For every closet beyond the first, the Council may charge 5s. per annum; for the first bath, 10s.; and for every subsequent one 5s.—all to be paid quarterly in advance, and to be recoverable in all respects with and as the water-rate. Where the supply is by measure, the price is not to exceed 2s. per 1000 gallons. The Council are authorized to purchase and supply water in bulk; but they must not lay mains in or interfere with any street beyond their limits. The consideration for the sale of the properties of the Water and Estate Companies is to be £20,250, *plus* a sum equivalent to the amount properly standing to the credit of the profit and loss account of the first-named Company on Dec. 31, 1912, up to the date that is fixed for the completion of the sale; such profits to be calculated on the basis of those earned during the twelve months immediately preceding the first-named date. The Council are given permission to borrow this amount and also the money necessary for defraying the costs and expenses incident to the transfer to them of the undertaking and properties (exclusive of the costs of the Act); £10,000 for the extension and improvement of the water undertaking; the sum required to pay for obtaining the Act; and any additional money needed, with the consent of the Local Government Board. For the repayment of the water-works purchase-money, fifty years are allowed; for the estate purchase-money, sixty years; for the extension of the water undertaking, forty years; and for meeting the cost of the Act, five years. [*Parliamentary Agents; Messrs. Butterworth and Co.*]

SULPHATE PROPAGANDA IN FRANCE AND BELGIUM.

We conclude our extracts from the report of the recent proceedings of Sulphate of Ammonia Manufacturers at the National Gas Exhibition, by giving the papers read by the representatives of France and Belgium—M. Lévy, of the Paris Gas Company, and Mr. Kirkpatrick, of the Belgian Syndicate and the Semet-Solvay Coke-Oven Company of Brussels.

M. Lévy dealt as follows with the

WORK OF THE "COMPTOIR FRANÇAIS DU SULFATE D'AMMONIAQUE."

The "Comptoir" was constituted on Jan. 1, 1908, and included thirteen companies. It now comprises thirty companies, the selling operations of which it controls in France, Algeria, and Tunis. From the outset, the "Comptoir" has considered the question of agricultural propaganda, to which it has devoted progressively increasing credits, and which next year (1914) will reach the sum of 210,000 frs. (£8400), representing for the tonnage of that year 3 frs. (2s. 4¾d.) a ton.

Our propaganda is carried on principally in the following ways: (1) By publications; (2) by competitions and exhibitions; (3) by experimental fields. The "Comptoir" has published 31 different pamphlets referring (*a*) to general cultivation in France, and (*b*) either to special cultivation or else to special districts or regions. About 800,000 copies of the different pamphlets were published and distributed in France, Algeria, and Tunis.

The agricultural information asked for by correspondence, together with the ordinary agricultural service, occasion at the present time an annual exchange of 15,000 letters, as well as the dispatch of 2000 postal parcels, addressed principally to schoolmasters for use in school museums.

The "Comptoir" organizes numerous competitions and agricultural exhibitions, and provides stands decorated with coloured pictures and photographs of agricultural fields, &c. One of our engineers attends the exhibitions, and furnishes visitors verbally with information with regard to sulphate of ammonia. During the first ten months of this year fourteen such exhibitions have been held.

The following are the exact numbers of the experimental fields in successive years: 1908, 10; 1908-9, 84; 1909-10, 716; 1910-11, 1693; 1911-12, 2162; 1912-13, 2558; anticipated for 1913-14, 5000. The geographical distribution of the experimental fields has been organized with a view to future consumption, to the situation of the manufacturing works of sulphate of ammonia, and to consignments of foreign sulphate (which arrive in France by land and sea without payment of Customs duties). These experimental fields are organized principally after visits paid by our agricultural engineers, (1) to professors and to agricultural schools, and (2) to associations of landowners and farmers—*i.e.*, agricultural syndicates or associations. In the first case the experiments have an official character which increases the importance of the results. In the second case the farmers, having, under the control of our engineers, themselves directed and organized these experiments, speak of them to their neighbours, give accounts of them in their meetings, and publish these accounts in local newspapers, thus creating in the locality confidence in the efficacy of sulphate of ammonia.

Our experiments are applied to all kinds of cultivation carried on in our climate, and particularly to: (1) Wheat, the most important French culture, extending over 16,000,000 acres. Tradition has always decreed that wheat shall receive the most abundant manuring; and this gives an opening for a large consumption of sulphate of ammonia. This is used especially in autumn, which enables producers to diminish their stocks, which are generally very full towards the end of the year. (2) Vines, in cultivating which France occupies the foremost place in the world, with a cultivated area of 3,700,000 acres. (3) Oats (cultivated area nearly 10,000,000 acres); potatoes (cultivated area 3,700,000 acres); beetroot (cultivated area nearly 2,000,000 acres). The action of sulphate of ammonia is singularly manifest on oats and potatoes. Not only is the pecuniary profit considerable, but the exterior effects are also clearly visible, which constitutes an excellent demonstration of its efficacy.

Until the beginning of the present year, all the experiments carried out in France were directed from the headquarters of the "Comptoir"—that is, from Paris; but, in order to obtain more satisfactory results, and to allow of better supervision of the experimental fields, the "Comptoir" has decided to decentralize its propaganda services by the creation of a certain number of district offices, most of which are already in existence, and others will soon be established. The propaganda in France will therefore comprise in 1914 six district offices.

Mr. Kirkpatrick read a paper on the

WORK OF THE BELGIAN SULPHATE OF AMMONIA SYNDICATE.

I had much pleasure in reading over recently the report of our last meeting, which took place on April 28, 1911, in London, and to realize how very useful was an exchange of views between the representatives of the different countries. This report showed clearly that we are all pursuing the same object, and that we all have the same interest to find the best means of attaining it.

Our object is simple—sell the whole production of sulphate of ammonia on the best possible terms, wherever it is made. As to the means to attain this object, they are also theoretically simple, but practically may be somewhat difficult to realize. We have to sell all quantities produced in England, Germany, France, Belgium, Russia, America, or any other country; and so we must find a market for such quantities. If production increases, consumption must necessarily follow. The great facility of transport in our days makes any market accessible to all manufacturers; and if the production of one country exceeds the home consumption, export becomes compulsory and competition starts. It is to avoid such competition that Germany, France, and Belgium have come to an understanding, and have endeavoured by propaganda based on similar lines to develop consumption for their ever-increasing productions.

Belgium is a small country, the production of which is tiny when compared to that of Great Britain or Germany. Its Syndicate represents at present 72 per cent. of the total production of sulphate of the country, which only amounts to 52,000 tons, and will attain 56,000 tons in 1914. We might have thought that such a small amount could always find a market without spending money in propaganda. But, convinced of the truth of the principles I have mentioned, our Syndicate wished to contribute to the general propaganda work, and will have spent this year £5400—viz., 2s. 4d. per ton of the sulphate it controls.

Our propaganda was followed up systematically on the usual lines—viz., demonstration and experimental fields, lectures, newspaper articles, pamphlets, posters, &c.; and we are very pleased to state that our efforts have been successful. Sulphate every year takes a more important standing in our country's agriculture. In many places where nitrate of soda was exclusively used, sulphate is now consumed. It is by displacing nitrate that we increase the use of sulphate. Belgium is still by far the country where chemical manures and sulphate of ammonia are used in greatest quantity per acre of cultivated land; so that it is more difficult to increase its consumption than it would be in other countries.

The following table shows, in kilogrammes, the total consumption of chemical manures and the consumption of sulphate of ammonia per hectare (2·47 acres) of cultivated land in several countries.

	Sulphate of Ammonia.		Chemical Manures.
Belgium	23·08	..	382
Germany	12·12	..	158
England	7·26	..	142
Netherlands	5·94	..	187
Italy	2·88	..	54
France	2·46	..	57
Spain	1·74	..	16
Austria-Hungary	0·44	..	48

In order to displace nitrate, we find it, as a rule, necessary that the unit of nitrogen should be a trifle cheaper in sulphate. It is most important to be careful that the quality of sulphate be regular and good, properly dried, and with a small acidity; also that packages should be well conditioned. We may say that these points are generally well seen to by our makers. Our propaganda has extended to all parts of agriculture, and our demonstration fields have met with much success.

I shall mention only a few of the good results obtained by the use of sulphate in place of nitrate. On corn, the straw was shorter; but the ears were bigger and fuller. On pasture grounds, its action is more durable; grass grows almost as soon as cattle have grazed it. For roots, such as beets, a mixture of sulphate and nitrate gave better yields than nitrate alone. On vegetables in general, sulphate of ammonia proved excellent. Floral plants had a finer colouring, and stood dry weather and heat much better. Vines were stronger, and gave more grapes, of better flavour, which ripened sooner. Young forest and fruit plantations were greatly improved by a judicious amount of sulphate. It is interesting to state that the Board of Agriculture, who used nothing but nitrate, have now recognized the good qualities of sulphate.

The exhibition at Ghent, where floral culture has a world-wide reputation, has been, we may say, a tremendous success for sulphate of ammonia. Our Syndicate built and furnished in the "Village Moderne," the "Burgomaster's House," the garden of which had the finest crops, the greenhouse the nicest vines, the lawns the best grass, thanks to the use of sulphate of ammonia. Outside the village, all plantations in the exhibition had labels telling visitors that sulphate of ammonia had been employed. In recognition, the Jury of the exhibition again granted to our Syndicate the highest award—the Grand Prize, a Diploma of Honour, and two gold medals. Such honours go to sulphate of ammonia in general, and to all who take an interest in the production of this valuable manure. They must feel in honour bound to keep up its reputation, and furnish, each in his sphere, the money required to make it known and to develop its use.

The Bonecourt Boiler.—By an inexcusable printers' blunder, in the seventeenth line of the first editorial in last week's issue, the Bonecourt boiler was referred to as the "Bournemouth" boiler. Most readers, we have no doubt, recognized the error; but it is well to mention it, as, to the best of our knowledge, there is no boiler that lays claim to the title of "Bournemouth."

TAPLAY'S COMBUSTION GAS ANALYZER.

A NEW FORM OF APPARATUS FOR COMPLETE GAS ANALYSIS.

By J. G. Taplay.

During the month of April, 1912, in an article written for the "Journal" [Vol. CXVIII., pp. 217 and 285], the writer described an apparatus for gas analysis by combustion over copper oxide. It will be remembered that, in order to determine the absorbable constituents, some extra apparatus, such as Bunte's burette, Hempel's or Orsat's, was necessary. Since then it has been considered desirable to incorporate absorption tubes with the combustion analyzer, and at the same time effect a considerable improvement in the method of combustion, whereby the carbon dioxide generator and the washer are dispensed with, and the gaseous contents of the combustion-tube are removed by means of mercury.

The method of combustion over heated copper oxide may be divided into three classes—viz.,

(*a*) That in which the combustion tube enclosing the copper oxide, both before and after the combustion is made, contains a volume of nitrogen purposely admitted.

(*b*) That in which the combustion tube containing the copper oxide is filled with carbon dioxide from a generator; a further quantity of this gas being employed after the combustion to sweep out all nitrogen residue from the combustion tube and connections, so that, after the absorption of the carbon dioxide by means of a solution of potassium hydroxide, a direct measurement of the nitrogen residue may be made.

(*c*) Or, that in which the combustion tube containing the copper oxide is filled with nitrogen from a reservoir; a further quantity of this gas being employed after the combustion to sweep out all the carbon dioxide formed during the combustion of a hydrocarbon gas or other CO_2-producing gas—the carbon dioxide after absorption by a solution of potassium hydroxide, owing to loss of volume, giving a measure of the hydrocarbon, or other CO_2-producing gas under analysis, and any nitrogen residue being estimated by difference.

In all these methods there is an objection to estimating the residue as the difference between the sum of all the other constituents of a gas mixture and the total quantity of gas taken for analysis, as such a method gives no guarantee that the volumes of the other constituents are correct, and therefore any error will fall on the residual gas.

The purpose of this article is to describe the complete apparatus under the following headings:

1. The construction of the apparatus and the manipulation of the portion employed for determining the absorbable constituents of the gas mixture—*i.e.*, carbon dioxide, olefines and benzene, oxygen and carbon monoxide.
2. The manipulation of the apparatus for determining the constituents in residual gas by combustion over the oxidizing material—*i.e.*, hydrogen, methane, and nitrogen residue. Attention is directed to the special combustion tube used, because it does away with the necessity of employing carbon dioxide, the use of which may possibly introduce atmospheric nitrogen, if in the hands of an inexperienced person. In this present form of apparatus, the Kipp carbon dioxide generator and the washer are not required, and the apparatus is thereby much simplified.
3. The method employed in determining the volume of carbon monoxide by combustion instead of by absorption.
4. The application of the apparatus to the determination of the carbon and hydrogen densities of the olefines (C_nH_m hydrocarbons).
5. The method employed in determining the volume of ethane when present in a gas mixture.
6. The application of the apparatus to the determination of the carbon and hydrogen densities of such liquid hydrocarbons as can be vaporized, mixed with a carrier-gas such as nitrogen, and remain as a vapour at ordinary atmospheric temperatures. By means of a combustion in the special combustion tube, a knowledge of the constitution of these hydrocarbons can be easily obtained.

1.—Description of the Complete Gas Analyzer.

In the accompanying illustration, fig. 1, A is the measuring burette of 50 c.c. capacity, B the levelling tube, C the water jacket, D a plate of opal glass to facilitate the reading of the burette, E a mercury reservoir, F a three-way tap blown on to the measuring burette, G a plain tap with a jet beneath to connect it to the sample of gas for analysis, H and I are taps which are closed after bringing to atmospheric pressure the gas within the burette, J is a permanently fixed pipette containing potassium hydroxide solution for the absorption of carbon dioxide either present in the original sample of gas or produced after the combustion of carbon monoxide or any hydrocarbon gas, and it is also employed to remove the vapour of bromine after the absorption of the olefines, &c., and to remove the vapour of hydrochloric acid after the absorption of carbon monoxide, should it be desired to effect the removal of this gas by means of the acid solution of cuprous chloride. J_1 is another pipette containing a solution of bromine in potassium bromide for the absorption of the olefines. This solution will also absorb benzene vapour; but inasmuch as present-day illuminating gas contains only a trifling amount of benzene vapour, the error of absorbing the olefines and the benzene together is negligible. Should the volume of benzene in the particular gas under analysis be appreciable, this pipette should be preceded by one containing bromine water only, in which case the olefines alone will be absorbed.

Other pipettes, similar to J_1, are as follows: One containing an alkaline solution of pyrogallic acid for the absorption of oxygen; and, if it be desired to determine the volume of carbon monoxide by absorption, two pipettes containing an acid solution of cuprous chloride, the second pipette containing a fresh solution.

The several pipettes (devised by Mr. Jacques Abady) containing bromine, pyrogallic acid, and cuprous chloride, are fitted with a tap U at the upper end, so that they may be closed and the pipette detached at the rubber joint beneath the Greiner tap L, in order to shake the gas with the reagent to facilitate absorption. In each case the vent or tubulure of the pipette communicating with the air is capped, when not in use, with a short piece of rubber tubing carrying a short length of solid glass rod. K and L are two Greiner taps making communication between the measuring burette A and the absorption pipettes, or between the burette and the capillary T-piece M, or between one pipette J and the other J_1. M is a capillary T-piece, connected to the mercury reservoir N, from which it is shut off by means of the screw pinch-cock Q, and brought into use when displacing gas from the capillary connections between the upper side of the taps K and L and the measuring burette A or the tap G.

O is a displacer of about 50 c.c. capacity, fitted with a tap P below, and with its upper end connected to the fused silica combustion tube S (devised by the writer), which contains the oxidizing material in the form of a rod supported in the centre of the tube on silica loops. R is a plain tap which is closed when

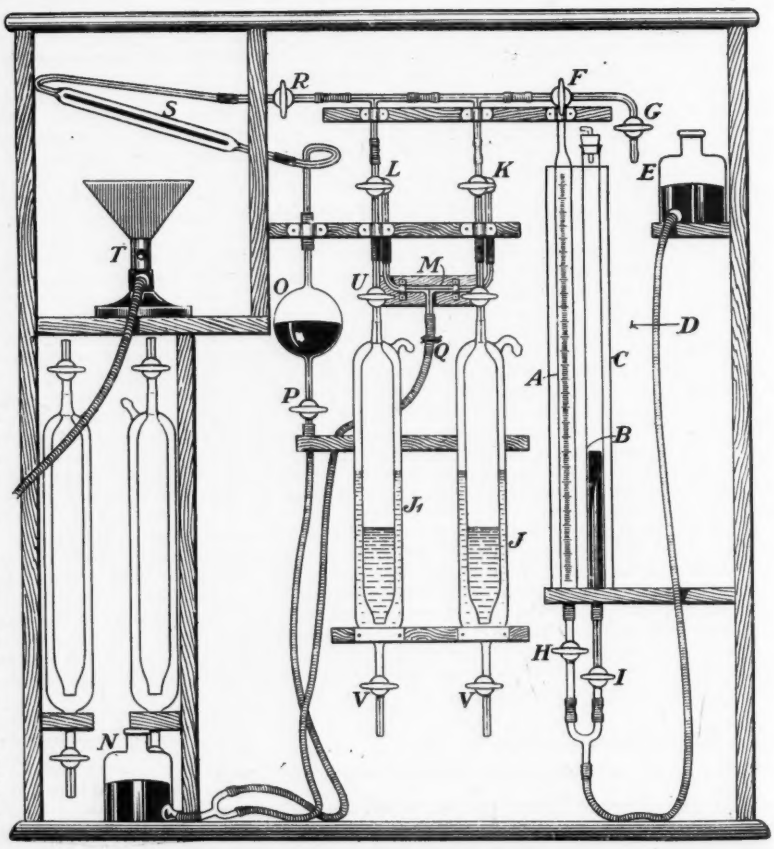


Fig. 1.—Taplay's Combustion Gas Analyzer.

determining the absorbable constituents of the gas, and also when washing out the capillary tubes after completing the absorptions. T is the gas-burner for heating the combustion tube, and V are taps to facilitate the removal of the reagent whenever necessary, and also to remove any mercury which may fall into the pipette from time to time.

For a list of the constituents to be absorbed, and the method of preparing the absorption reagents, the reader is referred to the writer's previous article in the "JOURNAL" mentioned above.

MANIPULATION OF THE APPARATUS.

To begin with, see that the measuring burette A, the displacer Q, the combustion tube S, and the connecting capillaries, the T-piece M, and the tap G are filled with mercury; also that the absorption pipettes and capillaries are filled with their respective reagents. The apparatus is then ready for taking in the sample of gas to be analyzed. Connect the supply of gas to the tap G by means of a rubber tube, and, with the taps F and R fully opened to the displacer O, and the tap P slightly opened. Draw in the sample until it nearly fills the displacer. Then shut the tap P, and with the tap H opened and the tap F turned so as to communicate between the measuring burette and the displacer. Raise the reservoir E and drive all the gas back towards the combustion tube; when the capillaries are filled with mercury, close the tap R. A reserve sample of gas is thus obtained. Now turn the tap F so as to communicate between the measuring burette and the supply through the tap G, and take in a volume of gas which does not come below the 50 c.c. mark. The tap F is now turned so as to shut off the burette, but at the same time to make communication between the capillaries on either side. The volume of gas within the burette is brought to atmospheric pressure and noted; the gas supply disconnected from the tap G; the Greiner tap K turned so as to communicate between the tap G and the mercury reservoir N. The latter is then raised, the screw-pinch-cock Q opened, and the gas in the tap G and capillaries displaced by mercury, after which all the taps are closed, beginning with G.

DETERMINATION OF ABSORBABLE CONSTITUENTS.

In this section it is presumed that the volume of carbon monoxide is determined by absorption in an acid solution of cuprous chloride.

Carbon Dioxide.—The gas after measurement is passed into the pipette J, which contains a solution of potassium hydroxide, and, after the absorption of the carbon dioxide, the gas is passed back to the measuring burette. The reagent is allowed to rise only to the top of the bore in the plug of the tap K. This tap is then immediately reversed, and the gas in the capillary tubes above driven into the measuring burette by means of mercury from the reservoir N, which is raised for the purpose—the screw pinch-cock Q being of course opened a little at the same time. The gas is brought to atmospheric pressure, and its volume noted. The difference between the original volume and this present volume represents the volume of carbon dioxide in the sample.

Olefines ($C_n H_m$ Group of Hydrocarbons).—The gas is then passed into the pipette J_1, containing a strong solution of bromine in potassium bromide. The upper tap U is closed, the pipette detached, and the contents shaken so as to facilitate the removal of the olefines. While shaking the liquid in the pipette, the vent or tubulure communicating with the air should be capped. It should be remembered that the pipette must not be laid down in a horizontal position or the sample of gas will be lost. The remaining gas will now be saturated with bromine vapour, which must be removed before passing the gas back to the measuring burette, otherwise the bromine will act on the mercury. To effect the removal of the bromine vapour, replace the pipette J_1, taking care that the capillary between the taps L and U is filled with mercury. Then turn the Greiner taps L and K so that communication is made between the pipettes J_1 and J. The gas may be transferred from the bromine pipette to the potassium hydroxide pipette either by attaching a piece of rubber tube to the tubulure of the pipette J_1 and blowing through the tube on to the surface of the reagent, or by filling the companion tube B with mercury and by means of a piece of rubber tubing connecting the tubulure of the pipette J with the open end of the companion tube B. As the mercury falls in the companion tube the reagent in the pipette J rises in the annular space, while the gas enters the central tube. After the removal of bromine vapour, the gas is transferred to the measuring burette in a similar manner to that employed after the removal of carbon dioxide. The volume of remaining gas is noted, and the volume of olefines determined.

Oxygen.—While the removal of the bromine vapour is being effected in the pipette J, the bromine pipette is detached and a pipette containing the alkaline solution of pyrogallic acid is fixed in its place, taking care that the capillary between the taps U and L is filled with mercury. The gas remaining after the removal of the olefines is then passed into the pyrogallic acid pipette for the removal of the oxygen, after which it is passed back to the measuring burette in the manner already described, and its volume again noted.

Carbon Monoxide.—The gas is then transferred to the potassium hydroxide pipette, and the pyrogallic acid pipette is removed and replaced by one containing an acid solution of cuprous chloride, after which the gas is passed into the cuprous chloride pipette and shaken with the reagent. The gas must afterwards be passed into a second pipette containing a fairly fresh solution of cuprous chloride, in order to remove carbon monoxide. The vapour of hydrochloric acid is then removed by transferring the gas from the second cuprous chloride pipette to the potassium hydroxide pipette, after which it is passed back to the measuring burette, and its volume noted at atmospheric pressure. The cuprous chloride pipette is then detached, and the pyrogallic acid pipette is fixed in its place and the residual gas in the measuring burette, consisting of hydrogen, methane, and nitrogen, is shunted into it until required for the combustion.

Before any combustion takes place, the mercury in the measuring burette and in the capillaries between the burette and the taps L and K must be washed with a dilute solution of sulphuric acid, in order to neutralize the potash which has entered them. Otherwise some of the carbon dioxide formed during the combustion will be absorbed by the potash, and the contraction after combustion, which should be due to hydrogen only, will be greater than it ought to be. The washing may be conveniently done by placing a small beaker or basin, holding the dilute sulphuric acid, in such a position that the jet below the tap G dips beneath the surface of the acid solution, and then drawing some of the solution into the burette by opening the tap H and lowering the mercury reservoir E. The tap G is then closed, and the acid solution passed through the capillaries between the measuring burette and the T-piece M by raising the reservoir E, turning the taps L and K in the proper direction, opening the screw pinch-cock Q a little and lowering the reservoir N. The whole of the acid solution is then discharged through the tap G, and the cleansed tubes are filled with mercury. It should be remembered that this washing must succeed each use of a pipette containing potash.

The combustion of the original gas, which has been stored in the combustion tube and displacer, may now be proceeded with, thus liberating that part of the apparatus required to effect the combustion of the residual gas. The combustion of the residual gas will now be described; that of the original gas, which is presumed to have already taken place, being dealt with further on.

2.—COMBUSTION OF THE RESIDUAL GAS.

The determination of hydrogen, methane, and nitrogen must now be described. For this particular combustion it is not necessary that the oxidizing material in the combustion tube shall be oxidized to its fullest extent. At the same time, if it is fully oxidized at the beginning, and always kept in that state after each combustion, it is in a condition to furnish complete data at any time. The displacer O, the combustion tube S, the measuring tube A, and the connecting capillaries being filled with mercury, a portion of the residual gas is transferred from the pyrogallic acid pipette to the measuring burette; the gas in the capillary tubes being driven into the burette by mercury from the reservoir N. The volume in the burette is then noted at atmospheric pressure. The tap R is fully opened, the tap P slightly opened, and the mercury in the capillaries and the combustion tube allowed to flow towards the displacer O, and the gas to take its place. The burner under the combustion tube is then lighted, and the latter is raised to a bright red heat. The gas is then passed backwards and forwards between the burette and the displacer until no further contraction takes place. This can easily be determined by occasionally bringing the mercury up to a selected point on the capillary tube above the displacer, then bringing the mercury within the burette to the same level as that in the companion tube, and observing the volume of gas. The combustion of hydrogen and methane together at a bright red heat will not occupy much time, because the gas comes into intimate contact with the oxidizing agent in the combustion tube.

Hydrogen.—When the combustion is completed, the burner is shut off, and the combustion tube allowed to cool. The cooling of this tube can be hastened by wiping it with a sponge filled with water, as such treatment will not fracture the tube. The remaining gas is then swept out of the displacer, combustion tube, and capillaries by means of mercury from the reservoir N, and collected in the measuring burette—its volume at atmospheric pressure being noted. The difference between the volumes before and after combustion represents the volume of hydrogen in the quantity of gas taken for combustion. Tap R is then closed.

Methane and Nitrogen.—The remaining gas is then passed into the potassium hydroxide pipette J, in order to absorb the carbon dioxide produced by the combustion of the methane. The residual nitrogen is returned to the measuring-burette and its volume noted at atmospheric pressure. The difference between the volume after removal of hydrogen and the volume of nitrogen—in other words, the volume of carbon dioxide absorbed by the potassium hydroxide—represents the volume of methane contained in the quantity of gas taken for combustion. After the completion of the combustion, tap R being closed, the burette and capillaries are again washed with dilute sulphuric acid solution in the manner previously described.

[See No. 1 "Example of a Complete Analysis," next page.]

3.—DETERMINATION OF CARBON MONOXIDE BY COMBUSTION.

The following is a description of the method employed when the carbon monoxide is to be determined by combustion over the oxidizing agent, instead of by absorption in the acid solution of cuprous chloride.

The volumes of carbon dioxide, olefines, and oxygen are absorbed in the manner previously described, and the combustion of the residual gas, containing hydrogen, carbon monoxide, methane, and nitrogen, is afterwards made. For this particular

combustion the oxidizing agent must be fully oxidized either by oxygen or air. It can be brought to the desired state by passing air backwards and forwards over it at a red heat until no further volume of atmospheric oxygen is absorbed. After passing air over it for some time, the state of complete oxidation of the material can be ascertained by drawing some air into the measuring-burette and noting its volume; then passing the measured air through the combustion tube and back again into the burette. If there is no loss of volume, the oxidizing material is in a state of complete oxidation.

The displacer O, the combustion tube, the measuring burette, and the connecting capillaries being filled with mercury, a portion of the residual gas is brought into the measuring burette, and its volume noted. The combustion of this gas is then proceeded with, preferably at a bright red heat. The writer has found that, at a temperature of 250° C., the hydrogen and carbon monoxide only are burned, while the methane is left unoxidized. At a temperature of 360° C. it was observed that about two-thirds of the total volume of methane was burned, and at the same time the combustion of the carbon monoxide was not complete—about a fifth of its total volume remaining unoxidized. The presence of the hydrogen causes this partial combustion of methane. For the fractional combustion of carbon monoxide and hydrogen it would be necessary to employ a thermometer, or the combustion tube could be heated by means of the vapour of some substance having a boiling point of about 250° C., to ensure that the temperature did not rise at most more than a few degrees above 250° C. This fractional combustion could be accomplished and the volume of carbon monoxide determined from the volume of carbon dioxide produced. The residual methane would afterwards be oxidized at a bright red heat, but it would take a long time to effect its combustion. It is therefore recommended that the combustion be made at a bright red heat, proceeding in the manner previously described. The contraction, the volume of carbon dioxide produced, and the volume of residual nitrogen are all noted. The residual gas is discharged, and the measuring tube and capillaries washed.

It is then necessary to re-oxidize the oxidizing material at a red heat—in other words, to replace the volume of oxygen given up by the active material in the combustion tube during the combustion of the carbon monoxide, hydrogen, and methane. This can be effected by means of air or oxygen; oxygen is preferred by the writer, because its action is quicker. It can be prepared by heating potassium permanganate, and stored in a pipette, or it can be prepared in a handy little apparatus designed by Dr. Levy [see "JOURNAL," May 20 last, p. 526].

No. 1.—*Example of a Complete Analysis.*

	C.C.
Original volume of gas	49·70
Volume after passing over KOH	48·75
Volume of carbon dioxide	0·95 (= 1·91 vol. per cent.)
	48·75
Volume after passing over bromine and potassium bromide	46·65
Volume of C_nH_m hydrocarbons	2·10 (= 4·22 vol. per cent.)
	46·65
Volume after passing over alkaline solution of pyrogallic acid	46·35
Volume of oxygen	0·30 (= 0·60 vol. per cent.)
	46·35
Volume after passing over acid solution of cuprous chloride	41·30
Volume of carbon monoxide	5·05 (= 10·16 vol. per cent.)

The residual volume, 41·30 c.c. is 83·10 per cent. of the original volume.

	C.C.
Volume of gas taken for combustion	19·20
Volume after combustion at a bright red heat	9·00
Contraction (hydrogen)	10·20

Then, $\frac{10{\cdot}20 \times 83{\cdot}10}{19\ 20} = 44{\cdot}15$ vol. per cent. of hydrogen.

	C.C.
Volume of gas after combustion	9·00
Volume after passing over KOH	2·00 (= vol. of nitrogen).
Volume of carbon dioxide	7·00 (= vol. of methane).

Then, $\frac{2{\cdot}00 \times 83{\cdot}10}{19{\cdot}20} = 8{\cdot}65$ vol. per cent. of nitrogen.

and, $\frac{7{\cdot}00 \times 83{\cdot}10}{19{\cdot}20} = 30{\cdot}30$ vol. per cent. of methane.

The complete analysis is as follows:—

Constituents.	Volume Per Cent.
Carbon dioxide	1·91
C_nH_m hydrocarbons	4·22
Oxygen	0·60
Carbon monoxide	10·16
Hydrogen	44·15
Methane	30·30
Nitrogen	8·65

Usually, the volume of oxygen required will be approximately equal to the volume of gas taken for combustion. A small excess over this should be drawn into the measuring-burette in order that after the re-oxidation there shall remain a volume sufficient to read. Therefore take (say) 1·5 times the volume of combustible gas. After noting the volume of oxygen at atmospheric pressure, manipulate the apparatus in a similar manner to that employed when making a combustion; and, when no further contraction in volume takes place, pass the residual oxygen back to the measuring burette and again note its volume. The difference between the two readings represents the volume of oxygen absorbed by the oxidizing material in the combustion-tube, and is equivalent to the volume required and abstracted from the oxidizing material during the combustion of the combustible gas.

We have now the complete data for calculating the volumes of hydrogen, carbon monoxide, methane, and nitrogen in the sample of gas taken for combustion. [See No. 2 Example below.]

No. 2.—*Example of a Complete Analysis.*

	C.C.
Original volume of gas	48·40
Volume after passing over KOH	47·40
Volume of carbon dioxide	1·00 (= 2·07 vol. per cent.)
	47·40
Volume after passing over bromine and potassium bromide	45·40
Volume of C_nH_m hydrocarbons	2 00 (= 4·13 vol. per cent.)
	45·40
Volume after passing over alkaline solution of pyrogallic acid	45·10
Volume of oxygen	0·30 (= 0·62 vol. per cent.)

The residual volume (45·10 c.c.) is 93·18 per cent of the original volume.

	C.C.
Volume of gas taken for combustion	18·10
Volume after combustion at a bright red heat	9·50
Contraction (hydrogen)	8·60

Then, $\frac{8{\cdot}60 \times 93{\cdot}18}{18{\cdot}10} = 44{\cdot}27$ vol. per cent. of hydrogen.

Volume of gas after combustion	9·50 c.c.
Volume after passing over KOH	1·70 (= volume of nitrogen)
Carbon dioxide	7·80 { = volume of methane *plus* carbon monoxide

Then, $\frac{1{\cdot}70 \times 93{\cdot}18}{18{\cdot}10} = 8{\cdot}75$ vol. per cent. of nitrogen.

Volume of oxygen taken into burette	25·50 c.c.
,, ,, ,, remaining	8·50
,, ,, ,, used in re-oxidizing	17·00
Deduct volume of oxygen used by 8·6 c.c. hydrogen	4·30
Volume of oxygen used by the CO + CH_4	12·70

Let *a* represent the volume of carbon dioxide produced.
,, *b* ,, ,, ,, ,, oxygen required by the CO + CH_4.

Then carbon monoxide $= \frac{2\,(2\,a - b)}{3} = \frac{2\,[2\,(7{\cdot}8) - 12{\cdot}7]}{3} = 1{\cdot}93$ c.c.

And methane $= \frac{(2\,b - a)}{3} = \frac{[2\,(12{\cdot}7) - 7{\cdot}8]}{3} = 5{\cdot}87$ c.c.

The percentage volumes are:

For carbon monoxide, $\frac{1{\cdot}93 \times 93{\cdot}18}{18{\cdot}1} = 9{\cdot}94$ vol. per cent.

For methane, $\frac{5{\cdot}87 \times 93{\cdot}18}{18{\cdot}1} = 30{\cdot}22$ vol. per cent.

The complete analysis is as follows:—

Constituents.	Volume per Cent.
Carbon dioxide	2·07
C_nH_m hydrocarbons	4·13
Oxygen	0·62
Carbon monoxide	9·94
Hydrogen	44·27
Methane	30·22
Nitrogen	8·75

(*To be continued.*)

Society of Engineers.—The annual general meeting of this Society was held at the offices, Victoria Street, Westminster, on Monday last week—the President (Mr. Arthur Valon, M.Inst.C.E.) in the chair. The result of the ballot was the election of Mr. H. C. H. Shenton as the new President, and of Messrs. Norman Scorgie, T. E. Bower, and Percy Griffith as Vice-Presidents. It was announced that the President's Gold Medal had been awarded to Dr. Eric K. Rideal, M.A., for his paper on "The Corrosion and Rusting of Iron," an abstract of which appears elsewhere. The report presented by the Council dealt with the many activities of the Society, and referred particularly to the consideration that is being given to the status of the engineering profession.

A TALK WITH THE JUNIORS.

By Mr. CHARLES CARPENTER, D.Sc., M.Inst.C.E.

[An Address to the London and Southern Junior Gas Association, Dec. 12.]

I have two duties to discharge this evening. The first is to express my sense of the honour you have accorded me by desiring that I would come here and address you. There is no more acute critic of men than the junior student or practician; and that I have been regarded as satisfying his exacting requirements implies a compliment of which I can only say it is appreciated if it is not deserved.

But the difficulty arises when I endeavour to prove, in fulfilling duty number two, that your confidence has not been misplaced. Here I stand in an endeavour to while away half-an-hour or so in a pleasant chat with you. But what shall I talk about? Stresses in gasholders, flow of gas in pipes, high heats or low heats, verticals, diagonals, horizontals—surely there is no dearth of subjects, each providing a substantial topic of conversation. But first of all a speaker has to get on good terms with, and ingratiate himself with, his audience. Why not bring down two birds with one stone and apply the golden rule of conversation and talk about the other party to it? Let us see how we can progress on that tack; for I should like to think that my talk might be not only friendly but useful. Helpful, that is to say, in the battle all have to fight—that of earning a competence in the profession or calling that has been chosen, and to succeed in it.

In the second epistle of his "Essay on Man," Pope wrote:

> "Know then thyself, presume not God to scan,
> The proper study of Mankind is Man."

To work steel you must know its properties, whether hot or cold. To equip and manage retort-settings you must know the characteristics of the compounds of silica and alumina of which the materials composing it are made. To carbonize coal to the best advantage, you must know how it responds to the varied treatment you are able to give to it. But all this will avail you but little in your profession if you do not know Man. There are persons crammed full with knowledge of the inanimate who become soured and disappointed with their want of success in life, the cause of which is they have not devoted some of their time to the study of mind as well as matter. What is the use of our knowledge of bricks and iron if we do not know enough to manage humanity under us as well as over us? Only by the few can the human countenance be read as we do a book; one of the reasons being, perhaps, that we do not learn that alphabet early in life, very frequently never. But the lines and light and shade of the face reveal, imperfectly perhaps, as our vision is more or less imperfect, the nature and character of the animating force beneath it. Livesey had the slightest possible furrow at the tip of his nose. On a visit to the sculptor who was making a bust of him after death, I pointed out that this feature was not existing. It had not been missed by all those connected or otherwise with him who had seen the model and pronounced it excellent; but it should have been there, just as much as the aspirate is necessary to happiness, for it indicated a phase of Livesey's character, and inseparable therefrom.

You can learn much of the qualities of steel, wood, and brass from their appearance, especially after the application of stress; and the human features will be just as illuminative if you will but take the trouble to learn to read them. With this knowledge you will go far in your endeavours to differentiate between the shy man and the artful one, and the frankly disposed one from him whom nothing on earth will make straightforward, until you have metaphorically pinned him in a corner in which he cannot wriggle. And of those above you, you will learn to whom to open your heart, before whom to guard it; whose spoken word you can rely upon, and him whom only black and white will bind. The study of mankind has the additional advantage that it can be perused anywhere and everywhere. We need never put our studies on one side except when it is necessary to take up those solitary ones of which the lamp is the best inspiration. But perhaps the greatest concomitant gain is the bracing-up given to our observing faculties, the full training of which is of the highest importance to the engineer. All of you who have read "Kim" remember how serious was his training in this respect; and it is no less necessary in our prosaic life here in Britain. A girder with more camber than it should have, a stack out of upright, an oscillating pressure-gauge, a weeping joint—all are symptoms of defects appealing at once to the trained eye for their remedy lest they become premonitors of disaster. Only second in importance is the skilled ear which hears amid the din of the industrial orchestra discord from the piccolo of a tappet or a bolt, or deeper tones from shafts vibrating through worn gears or slack pedestal caps. Probably more loss of efficiency arises from want of observation on the part of the controllers of plant than from actual wear and tear.

How are we to make the best of such qualities as we are endowed with? There is but one answer—"Training;" and here I fear that my principles are most unorthodox. School training, University training, practical training, and, I think I may add, Naval or Military training, all are important and even essential, but most prescribers mix them inefficiently. I believe sixteen is quite late enough for a boy to attend school; and then I would have him spend five years at workshop and practical training devoting most of his evenings to such classes as would lay a foundation for his theoretical knowledge. If he is fortunate, one, two, or even three years' University teaching, or its equivalent, will enable him to develop scientific knowledge of those problems with which he has been, during his apprenticeship, brought face to face, and will give him the opportunity of obtaining those credentials which should be as necessary to the practiser in a branch of mechanics as of medicine. There is, I am pleased to say, a growing tendency to regard with favour what we may call collegiate qualifications; and it cannot be too strongly impressed upon those who are seeking success as gas engineers that they should become attached, as students, to the parent Institution of Civil Engineers (of which gas engineering is a branch) with the determination to sit for the associate membership examination. A qualification such as this cannot fail to be useful, and its usefulness will be more and more recognized as the qualifications of the engineer are expected to reach a higher standard.

Perhaps it will not be out of place to refer here to another aspect of gas supply which is of hopeful augury to those who have entered its ranks. I allude to the growing importance of gas distributing and gas selling as adjuncts to gas making. Look down the list of the staff of one of our railways and note how necessary it has been to subdivide the duties and responsibilities. And I have no doubt that gas undertakings will require an increasing number of engineers trained to take charge of their supply districts for them, as they are, and have been, trained to take charge of works. To those who may be contemplating such employment, or qualifying for it, I would urge that they should include in their training a year or two in some commercial undertaking selling soap or tea, or even haberdashery, so as to acquire some knowledge of those principles of business life which are becoming more and more necessary in gas, as they have already in those large industries which have made our country famous. It does not do nowadays to stop at home and make gas, any more than it does to make scissors. We have got to be out in the world in touch with consumers—actual as well as potential—finding out their requirements, and seeing that they are satisfied. The engineer cannot afford to disdain the seller; he may often profitably fit himself to become one. There is a good authority for the belief that the Kaiser himself has, in the interests of his Empire, exercised the resources of the bagman's art

There is another direction in which the engineer should avail himself of all assistance possible, and that is from the laboratory. It is better to find out there how much ash he has in his coke th n that the user should discover it for himself and turn to some other fuel. He cannot hope nowadays to stumble upon improved processes. He had better leave the search for, and the control of, them in the hands of chemists, and content himself with their translation to the large scale and their general oversight. But above all preserve and maintain the independence of your positions. Remember that you are not keeping your own shop when you are managing a works, or a section of it, for some gas company or corporation. Your salary, and it alone, is your remuneration (often inadequate) for the duties you perform, and you cannot be too careful in disregarding any temptation to add to it by any means which would not bear the light of day. From coal supplies to engine oil you have no right to a farthing of a share in the profits of their sale to the undertaking with which you are associated. To act otherwise would be no remedy for a state of things I am no less ashamed of—viz., the inadequate salaries so often paid by those responsible for the management of gas undertakings. But the remedy is to raise the status of the profession, not to supplement its emoluments illegitimately.

Many years ago a manufacturer of gas plant, who had heard I was in a position to influence an order which would be going for some large renewals, said to me he had no agent in the South for a particular appliance concerning which he had patented, but that if an order for these came his way he would be very pleased to pay me the commission an agent would have had. He did not get the order. But we continued good friends; for there were many qualities I admired in the man, and he was full of shrewd worldly wisdom which interested me. As examples, he told me he always made a point of calling on his customers after lunch—they were then generally better tempered. He also let me into the secret of what a contractor means when he tells you he lost money over a certain job. It does not mean he was actually out of pocket, but that he had not made as much as he expected.

Many friendships are made or deepened over a smoke and a glass; but it will probably be found to pay best if these luxuries are in a general way postponed until after working hours. The man who returns from a midday meal bringing with him an atmosphere of haze and alcohol is not likely to impress those above him with the clearness of his wits.

Care and trouble taken in one's dress are rarely wasted. "Chiefs" are always on the look out for the pick of their respective baskets. The French say "Who wins the eyes wins all." We must not take the saying too literally, but there is a good deal of truth in it. Illogical! Very likely. The world is not governed wholly by logic, however; and it may be reasonably

considered that he who is careful of his own things may very likely be careful with his employer's.

Would it be inopportune here to utter a gentle warning against "cocksureness"? Auguste Comte said the more he knew, the more he knew that he knew nothing. In the history of our industry we shall find many things which were once cocksure, now to be described as fallacies; and there is no doubt, too, that many processes suggested long since would have achieved fruition had those connected with their trials not been quite so cocksure they were doomed to failure.

Above all things it is necessary to keep open a broad mind, as only then shall we be able to jointly weigh the "*pros* and *cons*" of the various matters we have in our daily lives to decide. You have probably heard the fable of the flat mirror meeting a convex mirror in a garden. "How silly you are," it said, "to represent Nature as you do, you must be mad to give everyone a large belly with small heads and feet, and change all straight lines into curved ones." "It is you who distort Nature," said the convex one, "your flat shape imagines trees to be straight because it makes them so, and you think everything is flat outside you as well as inside. Tree trunks are curved, that is the truth." A philosopher who came along pointed out that a concave mirror would produce a third and very different reflection, and suggested that the mirrors should not call each other names because they received different reflections. Let us seek truth by all means, but respect the visions of others to whom she appears differently.

Some weeks ago I was delighted, in turning over the leaves of our gas publications, to come across an address by Mr. Milne Watson in which he exhorted his audience to cultivate their imaginative faculties. I am entirely in accord with him, for no engineer can succeed without imagination. Consider the man who designed Euston Station for the London and North-Western Railway. His imagination all those years ago pictured the future of the line, and to-day it stands as the Gateway to the North—a monument to a magnificent and successful organization. Wellington said imagination was imperative for a general to be successful. He should imagine, for instance, what is going on behind the range of hills separating his army from that of his opponent. So with the gas engineer. It is of no use thinking only from his own point of view; he ought to be for ever imagining what his opponents are up to, and how they are utilizing their chances or natural advantages. And from these dreams he should evolve a practical policy which would carry his own business still further.

I have said the engineer should cultivate observation and analysis. He should not hesitate to turn the limelight on himself, nor shrink from summing up his best qualities and his lesser ones. At the outset I referred to the "Essay on Man." The last lines of the last epistle run—

"All our knowledge
Is ourselves to know."

There is nothing perfect in Nature or in mankind. We shall understand the possibilities of both better if we endeavour to familiarize ourselves also with their limitations. Honesty pays best in the long run, not perhaps in every case, but it will bring, if no other reward, a sense of satisfaction in your hearts which nothing can take the place of. Remember the Italian proverb:

"Più pelli di volpi che di asini vanno in Pellicciaria,"

from which we may conclude that it is better even to be beaten as an honest donkey than skinned as a thieving fox.

In the foregoing imperfectly expressed words, I have endeavoured to draw attention to some of the essentials of success as they appeal to me looking back over many years. I would urge you to love your work for its own sake, not for the reward it may bring; for all the gold of the Indies would not give you the same satisfaction as the knowledge that you have fulfilled your duties as far as the possibility within you, and that you have gained thereby the regard of all who know you.

Let me, in conclusion, remind you of the advice of Polonius to Laertes, in which you have the finest code of life for guidance in wordly things ever laid down by a man for men:

Give thy thoughts no tongue
Nor any unproportioned thought its act.
Be thou familiar, but by no means vulgar.
Those friends thou hast, and their adoption tried,
Grapple them to thy soul with hoops of steel,
But do not dull thy palm with entertainment
Of each new-hatched unfledged comrade. Beware
Of entrance to a quarrel; but being in
Bear't, that the opposed may beware of thee.
Give every man thy ear, but few thy voice:
Take each man's censure, but reserve thy judgment.
Costly thy habit as thy purse can buy—
For the apparel oft proclaims the man.
Neither a borrower nor a lender be:
For loan oft loses both itself and friend
And borrowing dulls the edge of husbandry.
This above all: to thine own self be true,
And it must follow as the night the day,
Thou canst not then be false to any man.

In the course of the first Thomas Hawksley Memorial Lecture, delivered by Mr. E. B. Ellington, M.Inst.C.E., before the Institution of Mechanical Engineers, he stated that, in connection with the flow of water through pipes, the formulæ available must not be implicitly trusted.

INSTITUTION OF WATER ENGINEERS.

The Eighteenth Winter Meeting of the Institution was held last Saturday, at the apartments of the Geological Society, Burlington House, W.—the PRESIDENT (Mr. C. Clemesha Smith, of Wakefield) in the chair.

MINUTES OF LAST MEETING.

The SECRETARY (Mr. Percy Griffith) read the minutes of the last annual meeting; and they were confirmed.

THE ANNUAL ACCOUNTS.

The PRESIDENT mentioned that the accounts had been bound up with the "Transactions;" and it would be observed that there was a deficit on last year's working. He was happy to say that during the present year their finances had been put on a surer basis, and they would have at the end to report not a deficiency but a surplus.

The accounts were adopted.

NEW MEMBERS AND ASSOCIATE MEMBERS.

The SECRETARY reported that the following candidates had been elected by the Council since the last general meeting:

Members.—Messrs. H. J. Atkinson, T. A. M. Brownlie, W. M. Cross, H. N. Giles, L. P. Marshall, and F. W. S. Stanton.

Associate-Members.—Messrs. P. C. Beeston, C. B. Ede, D. H. Thomson, D. C. Watson, and G. Whitaker.

Transferred from Class of Associate Member to Class of Member.—Messrs. C. Clegg, H. Robinson (Consett), and W. Wells.

AUDITORS.

On the motion of the PRESIDENT, seconded by Mr. HAROLD W. WOODALL (Bournemouth), Messrs. Wood, Drew, and Co. were appointed Auditors for the year, and Messrs. S. R. Lowcock and Herbert Lapworth, D.Sc., were elected as Hon. Auditors.

PAPERS AND DISCUSSIONS.

The papers and discussions (which will be dealt with in early issues) were taken in the following order:

"Compulsory Returns by Water Undertakings." By JOHN CHISHOLM.

"The Portland Urban District Council Water-Works (Friar Waddon Borehole Scheme)." By R. STEVENSON HENSHAW.

"The Solubility of Carbonate of Lime, and its Bearing upon Certain Processes for the Treatment of Water Supplies." By WILLIAM T. BURGESS, F.I.C.

"The Treatment of Plumbo-Solvent Water by Means of Mechanical Filters." By F. J. DIXON, Assoc.M.Inst.C.E.

OFFICE-BEARERS.

The Scrutineers (Mr. A. H. Jameson and Mr. F. H. Brunt) reported that the following members had been elected to hold office during the ensuing year.

President: Mr. Thomas Molyneux, of Stockport.

Vice-President: Mr. F. W. M'Cullough, of Belfast; and Mr. A. B. E. Blackburn, of Sunderland.

Ordinary Members of Council: Mr. S. C. Chapman, of Torquay; Mr. F. J. Dixon, of Ashton-under-Lyne; Mr. F. W. Davies, of Nottingham; Mr. W. Matthews, of Westminster; Mr. Henry Preston, of Grantham; Mr. C. H. Priestley, of Cardiff: Mr. H. W. Woodall, of Bournemouth; Mr. R. H. Wyrill, of Swansea; Mr. E. J. Silcock, of Leeds; and Mr. C. B. Newton, of Hull.

NEXT ANNUAL MEETING.

Mr. T. MOLYNEUX (Stockport) said he appreciated very highly the honour the members had conferred upon him in electing him President for the ensuing year. It was his pleasure to invite the Association to hold the next annual meeting in Stockport. They had some quite new works to show; among other things being one of the finest reservoirs of the size that had been made. There was also some reinforced concrete work, which would be interesting. He felt sure that they could make the meeting not only enjoyable, but instructive.

VOTES OF THANKS.

A vote of thanks was passed to the Scrutineers; and later on to the Council of the Geological Society for the use of the rooms, as well as to the authors of the papers.

Sulphate of Ammonia in China.—For many years Manchurian bean cake has been extensively employed as a fertilizer in the vicinity of Amoy; but since 1903 the use of sulphate of ammonia has become more common. To use the bean cake, the farmer must pound the large cakes to a dust, and this powder must be soaked in water for three days before it can be used. The sulphate of ammonia dissolves in water almost immediately, and thus can be used with greater facility. Of the two kinds of sulphate—the pure white and the grey-reddish mixture having a strong odour—the latter is the kind used. Sulphate of ammonia is used in the Amoy district principally for fertilizing rice and sugar-cane fields. It is said to have four times the strength of the bean cake, and to cost but three times as much. This, taken in conjunction with the added facility of application, creates a growing market.

NOTTINGHAM'S NEW VERTICALS.

Inauguration Proceedings.—Projected Expenditure of £100,000.

Postponed through a variety of circumstances to a date later than that originally arranged, the new installation of Glover-West vertical retorts was inaugurated on Thursday last at the Radford Gas-Works of the Nottingham Corporation.

It was altogether to the advantage of those who are responsible for the general administration of the city's affairs that the official proceedings should not have been undertaken when matters of important detail were in an inchoate state. The delay in the earlier stages of the work had been unavoidable, through recurring labour troubles in the large industrial centres preventing the delivery of materials within the prescribed period; while as to the site itself, there had to be surmounted unanticipated difficulties of no insignificant proportions, resulting from the presence of water—an offshoot of the River Leen—beneath the projected foundation of one of the benches. With arrangements now completed, the opportunity was afforded of witnessing in operation the whole of the works, which, for purposes apart from ceremonial inspection, have been running for some weeks; the maximum output of nearly 1½ million cubic feet of gas daily having been reached. Some little time, however, will yet elapse before, the trials having been completed, the works will, under the terms of the contract, be handed over to the Corporation. It almost goes without saying that to members of the Council, apart from those serving on the Gas Committee, the practical demonstrations afforded as to the new processes of manufacture were in the nature of a revelation in regard to up-to-date appliances.

Although developments will obviously be dependent upon economical results attending the present installation, it has already been made manifest that the adoption of the Glover-West system at Radford is not destined to be limited to the 48 retorts, arranged in six beds, which were thrown open to Corporation inspection on Thursday. The expenditure when the present works have been entirely completed will be represented by about £30,000; but the Chairman intimated that the outlay may ultimately reach £100,000—there being already adequate confidence as to the value of the new arrangements. The settings which have already been established are, it should be explained, taking the place of nine beds of seven old direct-fired retorts, 20 inches by 14 inches and 18 ft. 6 in. through; economy of space, as in all such installations, constituting a conspicuous feature. The old retort-house will afford ample space for the projected extensions; and there could be no more conveniently located site at the disposal of the Committee than that afforded by this by-station, where the change, at a centre contiguous to the Midland Railway, has been effected without interference with the main sources of existing production. A sum of £150,000 formed approximately the expenditure upon the Basford works, completed in 1883; and although the Radford depôt, even with the newer appliances, can never equal in size or importance that in the westernmost portion of the city, it is yet destined to become quite one of the most lucrative centres of Nottingham gas production. Significant of the sound basis on which Nottingham's chief municipal trading concern rests, is the fact that the cost of the present works has been entirely defrayed from the renewals account without addition to the capital charges of the undertaking. Therein lie some instructive comparisons, of which much has been heard locally of late, as to old and new methods of municipal finance.

Those invited to the inaugural ceremony, which was followed by a luncheon at the Exchange Hall, were welcomed on the Radford site by the Chairman of the Gas Committee (Alderman Albert Ball), a former Mayor of the city, whose brother (Councillor F. Ball) this year occupies the chief civic position. It was to the regret of his colleagues that Alderman J. P. Ford, the Vice-Chairman and the oldest member of the Committee, was unable to be present, in consequence of ill-health; but there was a large attendance of members of the Corporation, including the City Sheriff (Mr. Gregg), together with many of the principal officials, among whom were the Gas Engineer (Mr. John Wilkinson), Mr. W. G. Garton, Accountant to the Gas Committee; Mr. F. W. Davis, City Water Engineer; Mr. T. Barnes, Chief Clerk in the Gas Engineer's Department; and the Superintendent at the Eastcroft Gas-Works (Mr. W. Gregson), who formerly, as engineering assistant at the George Street offices, was responsible for the preparation of many of the plans of the new works.

The visitors received much interesting information upon points of essential detail from Mr. Wilkinson and members of the contracting firm, who were represented by Mr. John West, Mr. Fred West, and Mr. Ernest West, of Manchester—the latter of whom has had the superintendence of the works during the final stages of construction, and will remain in control of operations at Radford until the plant is handed over to the Corporation. Most of the visitors essayed the task of ascending to the loftiest portion of the building, where also the Chairman of the Committee joined in the work of explanation; the elucidation of details being further facilitated by the opportunity afforded on the ground floor for the examination of plans showing sections of the plant. It was noticeable from the labelling of the trucks upon the railway sidings that much local coal is to be utilized.

Upon the return for luncheon at the Exchange Hall, the chair was occupied by Alderman F. Ball, who was supported by the Mayor and Sheriff (Alderman Sir J. Turney), Alderman Radford, and others. After the Loyal Toast had been honoured,

The Mayor proposed "Success to the Nottingham Gas Undertaking," congratulating the Committee upon the excellent results of their work.

The Chairman, in reply, said that no Committee could possibly work more amicably together in the city's interests. The progress of the gas undertaking had been of a long-continued character. It might be interesting to recall that it was in 1818 that the Nottingham Gas and Coke Company was incorporated by Act of Parliament; the capital then being only £16,000, whereas there had been expended alone on the works inaugurated that day £30,000. The Company started to supply gas in 1819. The price charged for gas in 1820 was 12s. per 1000 cubic feet; but in 1873, when the Corporation took over the undertaking, the price was from 3s. 4d. to 3s. 1½d. The concern was very wisely acquired from the Company at a sum which was equivalent to something like £500,000. The quantity of gas sold at the time the concern was taken over was 552 million cubic feet per annum. Last year the amount sold totalled no less than 2168½ million cubic feet; the meters in use numbering 80,234, cookers in use 32,469, and gas-engines 836. The total paid out of the undertaking towards the relief of rates since it was taken over was £836,752. The policy of the present Committee was to remodel the works and bring them up to date, and to make them, if possible, second to none in the country—the expenditure being met out of revenue. They required more holder space, having nothing like the storage capacity which they ought to possess. They did not expect to supply additional storage out of revenue; but the policy they were determined upon was to rebuild the present works without coming to the Council and asking for authority to raise new capital. The desire of the Committee was to reduce as far as possible the cost of production, so that they might be able to supply the citizens of Nottingham with gas at a cheaper rate. He thought that they had made a very good start with the new works at Radford. Before embarking upon an expensive scheme, the Committee made all possible inquiries. He should say that Mr. John West had taken a part of greater importance in regard to the manufacture of gas than any man living at the present time. He was the first to introduce mechanical stoking into the gas industry. His early work in this connection for the Nottingham Corporation went back to the year 1892, when he carried out some extensive arrangements at the Eastcroft depôt. In 1895 he installed his patent compressed-air machinery at the Basford works. The appliances had performed splendid work ever since; and and they all hoped that his system of vertical retorts at Radford would be as great a success as his stoking machinery had been at Basford. To complete the works and render the plant capable of producing 3½ million cubic feet daily would cost them in all something like £100,000. He sincerely hoped that the Committee would go on with the project, and that they would finish it as soon as possible.

Mr. John West, whose name was coupled with the toast, remarked in response, that his firm had done their best to give the Nottingham Corporation satisfaction. He was pleased to be present, because he numbered the Nottingham Corporation as being among the firm's oldest customers. The aim of the firm was to provide the best possible materials and workmanship. It would have been observed, in the course of the inspection at Radford, that most of the machinery was of a very slow moving character. The wear and tear was thereby rendered lighter. Sir John Turney, in the course of the perambulation of the works that day, had put a question to him as to the probable life of the retorts. It was a knotty point, which they had not yet fully worked out. They assumed, however, that the retorts would last double the time of those established under the old plan. The success of the system had been such that they hardly knew which way to turn to complete orders on hand—having during the last six months received a quarter of a million pounds worth. What had pleased him more particularly was that during this period they had had repeat orders to the extent of £100,000. Nottingham possessed some of the best plant in the country; and their works had been admirably cared for. He acted upon the principle in relation to his own works at Manchester that nothing which was not up to date should be tolerated. If progress was to be maintained, machinery and plant must at all points be brought to the latest pitch of efficiency.

The Chairman expressed regret that, in proposing the toast, he had omitted to refer specially, as he had intended doing, to their excellent Engineer, Mr. John Wilkinson. He was satisfied that no corporation could have the services of a better official. No trouble was too much for Mr. Wilkinson, who was unwearying in his duties.

Mr. Wilkinson, who met with a cordial reception, expressed his acknowledgments to the Chairman for his kind references. A great amount of appreciation was, he said, felt by the chief officials regarding the Gas Committee and the Council generally. He came to Nottingham as an absolute stranger, and the two years he had spent in official work in the city had been among the happiest of his life. He hoped he might be spared to serve the Corporation for many years to come. He took charge of the undertaking on Jan. 2, 1912; and the Chairman did not leave him for one moment until, on Jan. 4, he had to take the first steps towards making this important contract. With the able assistance of the Chairman, he had to decide on the retorts to be adopted. Thanks to the kindness of the Committee, he was enabled, twelve months later, to make a Continental tour of inspection, and he reported to the Committee, after full consideration, that he had no hesitation in saying they would be perfectly satisfied if they adopted the Glover-West system.

Sir John Turney congratulated the Committee and the Engineer upon the great success which had attended the gas undetaking. He proposed the healths of the Mayor and Sheriff.

The toast having been acknowledged, the Ex-Mayor (Mr. T. Ward) moved a vote of thanks to Mr. Albert Ball for presiding.

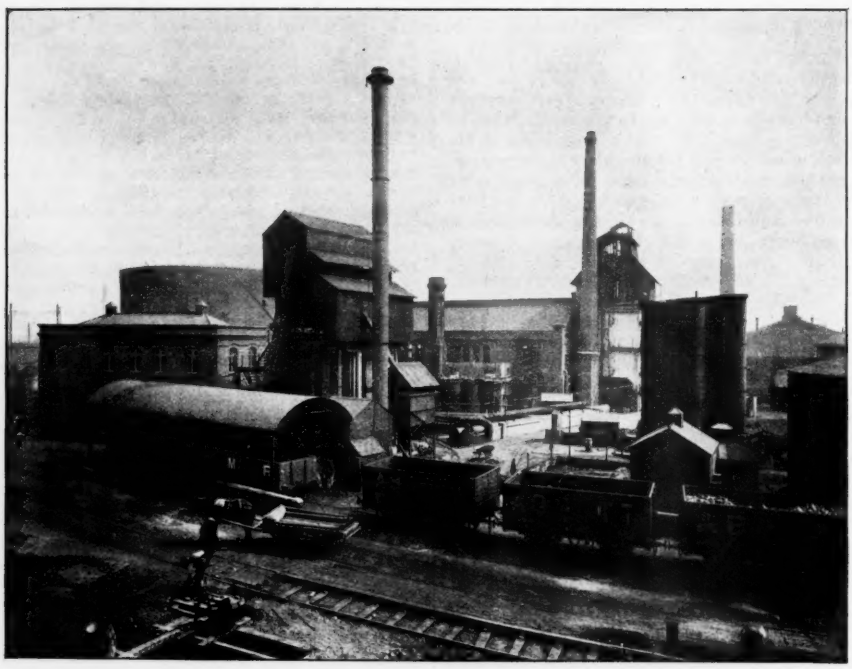
Mr. Fred West, who seconded the proposal, presented, on behalf of his firm, a silver salver, suitably inscribed, to the Chairman of the Gas Committee, in commemoration of the day's proceedings.

The vote was heartily accorded.

THE BIRMINGHAM COAL-TESTING WORKS.

By E. W. Smith and G. C. Pearson.

[A Paper read before the Midland Junior Association, Dec. 13.]



VIEW OF THE BIRMINGHAM COAL-TESTING WORKS.
(The Dessau Plant in the Foreground.)

The large-scale coal-testing works at Birmingham, constructed in 1905, were built upon the piece of land adjoining the Saltley and Nechells works of the City of Birmingham Gas Department. The plant then erected has been before described. It consisted of a horizontal retort-house and complete condensing, exhausting, and purifying plant, &c.—being in every sense a complete gas-works in itself. Since then there have been continual increases of both carbonizing and general gas apparatus. The works now comprise installations of horizontal and both intermittent and continuous vertical retorts, each being complete in itself, with coal and coke storage, retort-house governor, &c.

Horizontal Installation.

A range of four beds of six Waddell's regenerative 20-feet through retorts of ⌂ section, 21 inches by 15 inches. The standard carbonizing rate is 6½ cwt. per retort per six hours. The charging of four retorts per hour is done by hand shovel. The installation carbonizes a total of 31 tons of coal per day. [For illustration, see p. 879.]

Dessau Installation.

One setting of eighteen 4-metre retorts, oval section at top mouthpiece, 17 inches by 10 inches, with taper of some 4 inches. The retorts are arranged in six rows of three; the charging of each of these sets of three retorts being in one operation, as is also the discharging, and one gas take-off pipe serving for the three retorts. The bottom lids are actuated by hydraulic machinery. The average charge per retort, allowing for scaling, is 7¾ cwt.; the duration being generally twelve hours. Unless a more even quality of gas is required for testing, it is usual to work this plant in two shifts of eight hours each from 6 to 2—a rest of four hours taking place between the shifts. During each of these shifts a set of three retorts is charged every one hour twenty minutes. The installation thus carbonizes a total of 14 tons of coal per day.

Woodall-Duckham Installation.

One setting of four slot retorts, 25 feet long and of rectangular section, 46½-inch by 8-inch top mouthpieces, tapering 14 inches to the bottom; each retort dealing with 5 tons of coal per day. The power for the driving of the coke extractors to each retort is supplied by a 3 H.P. steam-engine.

A novelty in regard to this plant is that the setting is supported upon ferro-concrete columns; the usual bracing being supplied by means of ferro-concrete girders. The installation carbonizes a total of 20 tons per day. [For illustration, see p. 879.]

The Washing and Purifying Plant.

As already mentioned, there is only one set of washing and purifying apparatus, this being designed of such capacity as to deal with the gas of one installation only at a time. A scheme was therefore devised to provide for coupling-up the three installations in such a manner that the gas made from any one of them passes through the testing apparatus; while the gas from the remaining two installations passes, *viâ* a set of newly installed condensers and meter (measuring crude), to the Nechells works' exhausters.

The General Working Arrangements.

Adequate arrangements have been made to efficiently isolate to the set of testing apparatus each installation as required; all valves relating to the control of gas, tar, or liquor being fitted with locking gear. The mechanical behaviour of these three distinctive types of gas-making plant can thus be observed side by side, while the testing of each takes place under similar conditions.

The capacity of these installations, forming the total carbonizing unit at the coal-test works, is 65 tons, equal to a gas make of about 800,000 cubic feet per day, or 250 millions a year—being of such a size as to aid substantially in supplying the city. The works are so designed and controlled that they provide for experiments being carried out upon a large scale, and yet permit a careful adjustment and observation of the whole process; while the organization is such that the gas is made at a comparatively low cost. The valuable testing results are thus obtained at a working figure only little more than the usual Birmingham works' rates.

There are many uses for a coal-testing works other than for the very valuable comparative testing of coals. Experiments are made for the determination of the most suitable method of working to obtain the most economical result with each different coal on each different installation; the results in each case being considered upon a detailed commercial balance-sheet—each item calculated upon the latest market price. There also arises the investigation of suitability of different types of gas-making plant to meet the special requirements of certain works. Experiments are conducted for the purpose of trial of new gas purification apparatus, such as washers, tar-extractors, &c. Trials of oxide, paint, oils, &c., are carried out in a practical manner.

The chemical testing apparatus employed is maintained at a high state of efficiency, the well-equipped Central Laboratory being adjacent to the works. Before coal-testing commences, a period is allowed to elapse in which the desired conditions are obtained and all apparatus cleared of products foreign to the particular test. A test then runs a minimum of 2½ days, or a weight of 50 tons of coal is usually carbonized in the experiment. The question of sampling generally is carefully studied, and the determination of the quality of the gas is made upon samples collected in a small holder over each shift of eight hours; three samples being thus tested per twenty-four hours. The weighing machines, station meter, and general measuring apparatus are periodically adjusted and checked.

The energies of all connected with the test-works have been largely spent during last year in connection with the furthering

of experiments on liquid purification which were commenced by Dr. Davidson before his translation to Nechells works two years ago. This work is now nearing completion. The whole of the gas from the Woodall-Duckham installation is being continuously treated over an extended period, and very interesting data are being compiled.

THE USE OF A CALORIFIC VALUE RECORDER IN TESTING.

We bring to your notice a few typical charts showing variations in calorific value as obtained under the conditions on one or other of the test installations by means of a recorder.

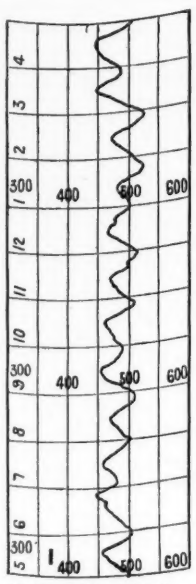
The instrument in use is the Simmance-Abady calor-graph. It has so far proved extremely useful and satisfactory. It acts as a "tell-tale," showing any variation in the working of the plant it may be connected to. Chart No. 1 is from the gas made on the horizontal installation, three retorts being charged per hour. The operation of charging and discharging occupies 25 minutes. This period and the frequency of charging largely account for the roundness of the curves as compared with the Dessau plant (the curve from which is shown as No. 2) where three retorts are charged every two hours; the period of charging and discharging being only from 5 to 6 minutes. Chart No. 3 shows the gas from the Dessau plant working two shifts per day; one set being charged and discharged every 80 minutes (during the shift of eight hours), an interval of four hours between each shift.

Chart No. 4 shows the line obtained from the Woodall-Duckham installation of continuous verticals. It would not be easy to maintain a line quite so good as this over a long period; it would be similar to gas from plants working intermittently if the gas were sampled from a holder. The better the supervision generally the nearer the line approaches the illustration.

Chart No. 5 shows a mixed gas from both plants. Chart No. 6 shows the value of the recorder as a "tell-tale" on bad working. During this period delays in charging occurred, and air in various quantities got into the gas during the usual weekly cleaning of the gas take-off pipes. The chart should otherwise have appeared as No. 3.

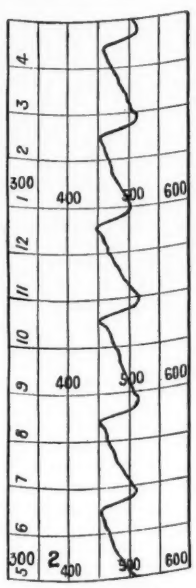
Chart No. 7 shows that pull on the Dessau retorts was maintained during the shift, as indicated by the irregular line. Anti-dips are used while the lids are open, and that on No. 1 was broken, and allowed air to enter the hydraulic main during discharging.

Chart No. 8. shows the effect of the dilution of the gas



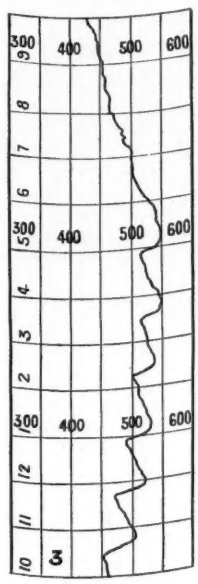
Horizontal Installation.

Three Retorts charged per Hour.



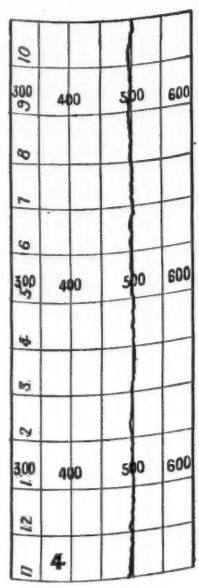
Dessau Installation.

Three Shifts of Eight Hours per Day. One Set of Three Retorts charged every Two Hours.



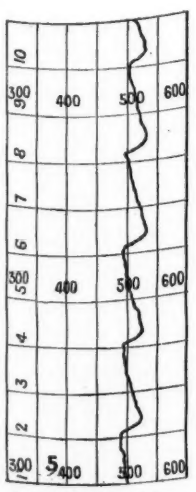
Dessau Installation.

Two Shifts of Eight Hours per Day. Eighteen Retorts charged (in Six Sets of Three) during Eight Hours, followed by a Four-Hour Interval.

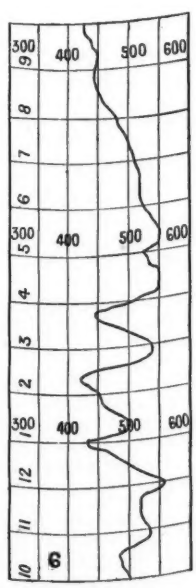


Woodall-Duckham Installation.

Continuous Charging.

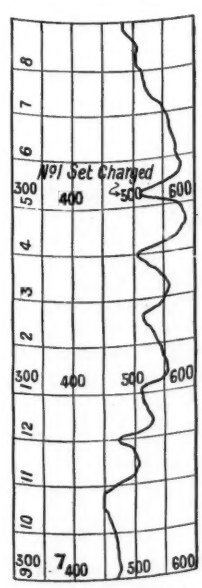


Mixed Gas from Dessau and Woodall-Duckham Installations.



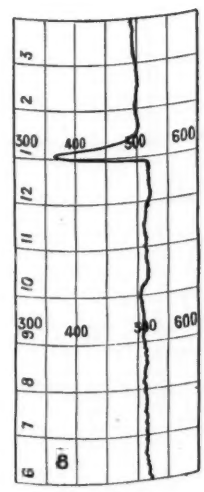
Dessau Installation.

Two Shifts of Eight Hours per Day. Gas Take-Off Pipes being Cleaned.



Dessau Installation.

Two Shifts of Eight Hours per Day. No Anti-Dip on Gas Take-Off Pipe from No. 1 Set.



Woodall-Duckham Installation.

Continuous Charging. Fresh Oxide Box put on.

CHARTS FROM THE CALOR-GRAPH AT THE COAL-TEST WORKS.

A RECORD OF CALORIFIC VALUE OF THE STREAM OF GAS PRODUCED UNDER VARYING CONDITIONS.

through the putting to work of a freshly-charged purifier-box. This should have had the appearance of Chart No. 4.

The records from all but the continuous verticals appear very irregular. Needless to say, in a large works these curves might be levelled-up and a more or less regular line be maintained.

A Comparison of the Illuminating Values Obtained by Different Burners.

The time has not yet come for the illuminating value of town's gas to give place entirely to the increasingly more important consideration of calorific value, although the tendency at the present time is to reduce the illuminating standard and adhere more closely to a heating standard. While, however, the former standard is in vogue, much careful thought must still be given to its maintenance, so that the best economic production may result.

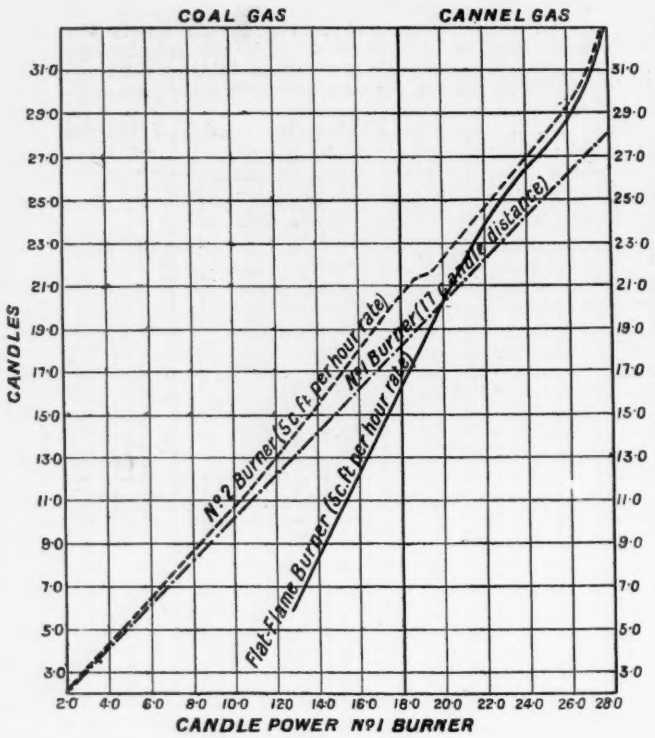

COAL GAS
CANNEL GAS
CANDLES
No 2 Burner (Sc. Ft. per hour rate)
No 1 Burner (17 candle distance)
Flat-Flame Burner (Sc. Ft. per hour rate)
CANDLE POWER No 1 BURNER

Chart A.

In many instances, a reduction in candle power standard has been brought about by the adoption of the No. 2 "Metropolitan" burner, in place of either the No. 1 "London" argand or the flat-flame. It will serve some purpose, therefore, if we examine figures and curves which represent the illuminating values of various

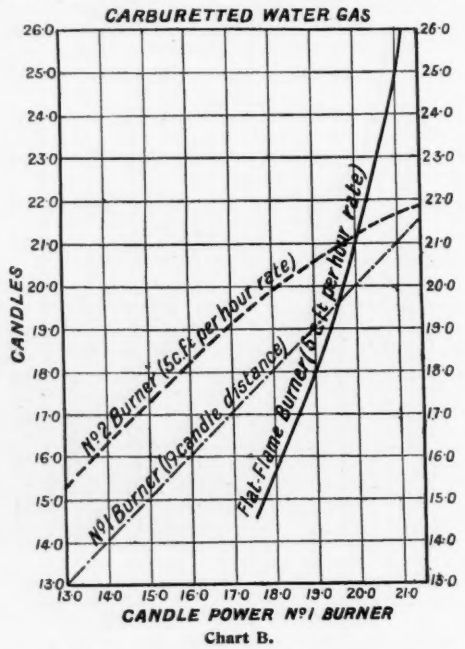

CARBURETTED WATER GAS
CANDLES
No 2 Burner (Sc. Ft. per hour rate)
No 1 Burner (17 candle distance)
Flat-Flame Burner (Sc. Ft. per hour rate)
CANDLE POWER No 1 BURNER

Chart B.

gases as obtained by means of different burners, and note the influence of the latter on the former.

The three charts (A, B, and C) have been compiled from an average of a large number of tests over a long period. The

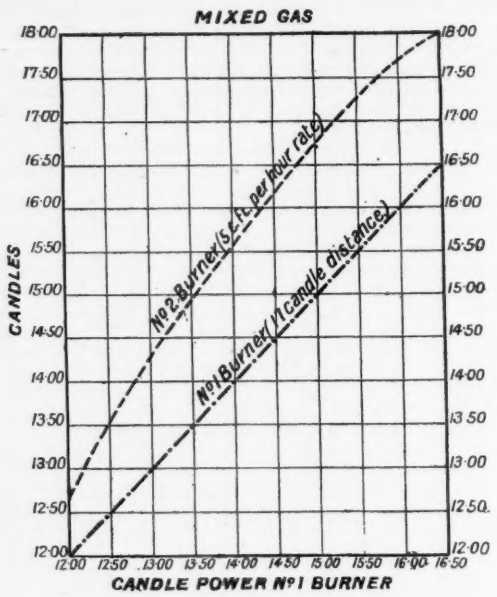


Chart C.

curves are intended to compare the illuminating values of stated gases, determined by either the No. 2 or the flat-flame burner (vertical scale) with the No. 1 burner plotted from the horizontal scale. The method of testing on No. 1 burner is with the 17 distance and not with the perhaps more usual 5 cubic feet per hour rate. It is not intended to discuss the policy of the method of testing; it being sufficient for the present purpose that the same method should be used throughout the determinations.

These results confirm in an interesting way the long-held views as to the mechanism of the luminosity from hydrocarbon flames. We know that the luminosity of a coal-gas flame depends partly on the number of free carbon particles present in the flame. It also depends on the temperature of the flame, and, therefore, on the extent to which the carbon particles are raised to incandescence. The calorific value of the gas and the nature and relative quantity of the products will influence the temperature of the flame, and therefore its luminosity.

Luminosity will also depend on the form of burner that is used, as on the adjustment of the burner depends the flame temperature and the extent to which the carbon is freed in the flame. The air-adjuster on the No. 2 burner is for controlling the air supply, not for increasing it. Lower illuminating powers with the No. 1 are due rather to over-aëration of the flame. This is also more obviously the case with flat-flame burner results, except in cases where the gases are so rich that with free access of air there is still insufficient air to bring about the highest flame temperature consistent with the maximum separation of carbon in the flame. This is indicated very clearly on Chart B (water gas).

Above 21 candles on the flat-flame for carburetted water gas the illuminating powers are higher on this burner than on either of the other two; and the difference increases with the richness of the gas in hydrocarbons. The results of Nos. 1 and 2 burners are about equal at 22 candles; and this chart (B) shows that the advantage of No. 2 over No. 1 burner becomes increasingly less above 17 candles (No. 1). It is very marked over 19 candles (No. 1). Each burner appears to be best suited, compared with the other two, to a particular gas of a particular candle power. Chart A (coal gas) is interesting from this point of view, because it indicates that, whereas in Chart B the results from Nos. 1 and 2 burners became more equal as the gas reached 19 candles on No. 1 burner, the results from coal and cannel gas are entirely different, as an increasingly higher result is obtained with No. 2 burner, compared with No. 1, as the illuminating power (on No. 1) increases. The results obtained from the mixed gas tend to blend. The figures from mixed gas, Chart C, indicate a blending of the effects from Charts A and B. There were a much smaller number of tests available for the construction of this curve.

In this connection, Table I. is of interest. Here it will be seen that the gas with the highest percentage of hydrocarbons has the lowest calorific value. Calculating back from the density of the two mixtures of gases, one concludes that the hydrocarbons in the carburetted water gas are, on the average, heavier than those in the other mixture of cannel and coal gas. Other things being equal, the illuminating power should consequently be higher. The calorific value is too low, however, to raise the hydrocarbons (better in quantity and density) to a sufficient incandescence; and the gas with the higher calorific value has relatively the higher illuminating power. The specific heat of the products of the cannel mixture is about 3 per cent. greater than that of the carburetted water gas, but the calorific value is over 11 per cent. higher also. So that the flame temperature of cannel gas in this instance is likely to be higher than that of the carburetted water-gas flame.

The whole of the above data, which have been most carefully

compiled, indicate how unsatisfactory are all the methods of testing illuminating powers. The results from both Nos. 1 and 2 burners have necessarily an unreal value, as the usual method of obtaining illumination from gas by the consumer, even when he does not use the incandescent mantle, is certainly not by means of either of these burners. It is evident that they cannot give results that are consistently higher or lower than those obtained by the consumer; and with the introduction of new methods of carbonization, in which hydrocarbons of different composition are being obtained, the falsity of the position is only accentuated.

Much is to be said for the contention of Dr. Davidson, made in his Young Memorial Lecture, that while a considerable percentage of the sale of gas was for use in flat-flame burners, then this ought to be considered in fixing an illumination standard. This appears fair business dealing; for, although the flat-flame burner is undoubtedly an unscientific method of obtaining illumination, yet if consumers in spite of all wish for their special purpose to use gas in this manner to the extent of a large proportion of total gas sales, then they have a right to expect to be supplied with a reasonable commodity for their purpose. It is seen from Chart A that for gas round values of 16 candles (No. 2) they actually realize an illuminating value of some 7 candles below the standard. The consumer theoretically suffers no hardship in any case, as whatever burner is employed it is the one he has chosen through his representatives as the standard to be used.

Effect of Introducing No. 2 Burner.

It is interesting to consider the effect of the reduction of illuminating value upon gas-making results. The advantage derived varies, of course, with the quality of coal used, and with the system of carbonization employed. Under true distillation conditions—the quality of gas being taken as it comes—horizontal or inclined retorts undoubtedly yield better results than either intermittent or continuous verticals, both on illuminating and calorific bases. But if either horizontals or inclines are worked under such conditions as to make low-grade gas, then the question is entirely changed—the above advantage being increasingly less.

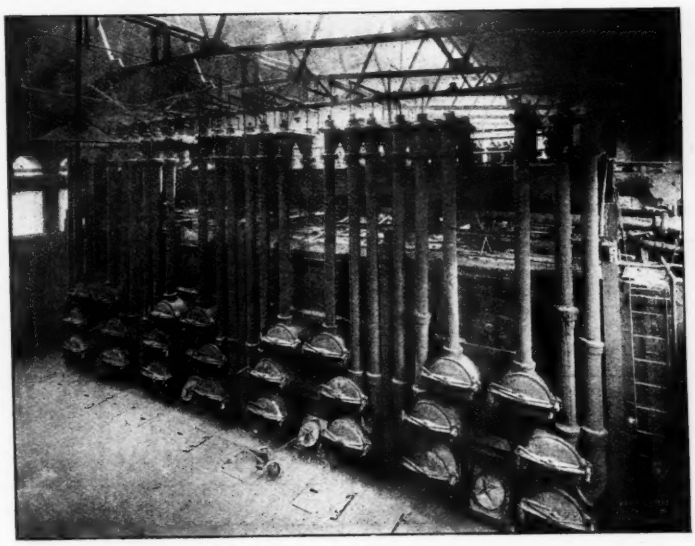
It is necessary to-day to supply gas of good heating value, constant specific gravity, and, in addition, to still maintain gas of standard illuminating value, although this latter may be lower than formerly. Without any reorganization of plant to meet these newer requirements, it is a simple matter to manufacture gas of comparatively good calorific value, accompanied by a low illuminating value, if conditions are allowed by which such diluents as nitrogen and carbon dioxide are introduced. The operation is certainly accompanied by an increase, more or less substantial, in the make of gas, but cannot help but be most uneconomical, as these impurities have a drastic effect upon the illuminating value—1 per cent. of N_2 added reduces the illuminating power 2·6 per cent., and 1 per cent. of CO_2 added reduces the illuminating power 3·5 per cent.—cause high and necessarily (of even more importance) varying specific gravity, and a reduction in flame temperature. These conditions in the gas render futile adjustments made in gas consuming apparatus of all kinds.

It is now generally recognized that the vertical retort is distinctly suited for the manufacture of low-grade candle power gas accompanied by moderate calorific value. In other words, the vertical retort yields "true" low-grade gas—a gas extended by "cracking." Yet doubtless a large number of rich hydrocarbons escape to the formation of tar, making up the balance-sheet of distillation. The high yield of residuals generally is a great commercial advantage of the vertical retort.

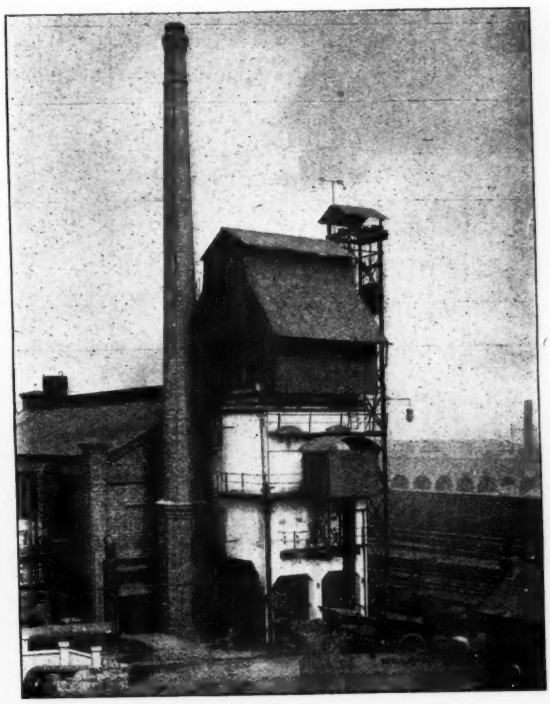
Table II. gives a few comparative tests with various quality coals upon different carbonizing systems, showing the advantage in practical working of the adoption of a No. 2 "Metropolitan" burner illuminating standard. The figures cannot be used as a comparison of gas-making installations, as the coals used in the experiments, although of similar classification of quality, are not necessarily from the same seam or district. It is noticed in the case of horizontal retorts that the lower candle power is in most cases of necessity accompanied by an increase of nitrogen and carbonic oxide, a degraded illuminating power multiple, and an increase of specific gravity. The calorific multiple is increased, as by over-pulling losses of gas in manufacture are reduced; while the effect of impurities on the calorific value is balanced by their addition to the make of gas.

In the case of verticals, genuine low-grade gas results; no such dilution being required. It is observed that in the case of the Dessau installation the results are in some instances those obtained by the use of steam admission at the latter end of the charge. This method of extending the make of gas is quite a separate consideration from that of carbonization; but for the manufacture of low-grade gas it is a most useful adjunct. We are convinced that (especially with rich coals) the practice of steaming is not accompanied by any means with a proportionate drop in illuminating value—it having been repeatedly possible to obtain with coals of class A a greater candle power multiple than that obtained in horizontal practice under best working conditions. It is much more economical to manufacture the water gas by steaming retorts than by a separate producer.

The water gas no doubt serves the purpose of sweeping-out the retort; small quantities of hydrocarbons being fixed in the process. An average sample of the gas made during the usual steaming period at the latter end of the charge will be found to contain from 0·1 to 0·5 per cent. of unsaturated hydrocarbons, according to the quality of the coal carbonized; while the CO_2 content is not usually higher than 2 to 3 per cent. A matter we intend to investigate in the future is the uncertainty of the quantity of grains of sulphur (CS_2 compounds) per 100 cubic feet in the pure gas. Very erratic results seem to be obtained, as may be seen from Dessau figures [see Table II.]. It is seen from Table III. that only a small amount of sulphur is present in the water gas manufactured in the retorts. A test was made on the Dessau installation lasting 36 hours, in which all the retorts were allowed to burn completely off; steam being then admitted in such quantity as to maintain the usual output of gas from the setting—about 7000 cubic feet per hour. Some particulars are given in Table III. It is possible that at least part of the traces of cyanide, ammonia, and naphthalene found in the water gas were picked up by passage through a plant previously used for coal gas, but the results are the average of tests taken over the whole period.



Horizontal Retort-House.



Woodall-Duckham Plant.

As far as could be ascertained in so short a time, the fuel con-

TABLE No. I.—*Comparative Anaiysis—Coal Gas and Carburetted Water Gas.*

Description.	I.P. Flat Flame Referee 5 Cubic Feet Rate.	C.V. B.Th.U. Net.	CO_2.	O_2.	HC.	CO.	CH_4.	H_2.	N_2.	Sp. Gr. of Gas.
Cannel gas . . . . . 25 per cent. Coal gas . . . . . 75 per cent.	19·98	612	2·3	0 7	8·6	6 9	34·8	38·7	8·0	·516
			Corrected to basis of 1 per cent. N_2 :—							
			2·5	0·7	9·3	7·4	37·5	41·6	1·0	
Carburetted water gas.	19·80	550	4·1	1·0	12·5	30·7	28·4	20·0	3·3	·700
			Corrected to basis of 1 per cent. N_2:—							
			4·2	1·0	12·8	31·5	29·0	20·5	1·0	

TABLE No. II.—*Gas-Making Results Maintaining Similar Candle Power on Nos. 1 and 2 Burners.*

COALS. CLASS A.

Installation.	Conditions of Test.	Make Per Ton Cubic Feet.	I. P.		I. P. Multiple.		C.V. B.Th.U.Net.	C.V. Mult. Net.	Gas Analysis.								Sp. Gr. of Gas.	Grains S. Per 100 Cub. Ft.	Cyanide Lbs. Per Ton.
			1	2	1	2			H_2S	CO_2	O_2	HC	CO	CH_4	H_2	N_2			
Horizontal.	Ordinary	11,920	**16·64**	(19·78)	207·6	246·8	549	655	1·50	1·74	0·50	4·12	9·05	37·5	41·4	5·6	·435	29·7	3·99
	Light charge high temp.	13,025	(15·27)	**16·91**	198·9	220·3	518	675	1·33	2·40	0·50	3·50	10·80	29·0	46·9	6·9	·463	34·3	4·74
Dessau . .	12 hours' duration. No steam . . .	12,220	**16·57**	(18·76)	202·5	229·3	546	667	1·10	1·40	0·80	3·60	7·40	31·7	50·5	4·6	·462	33·7	2·89
	13 hours' duration. 3½ hours steam .	15,540	(14·25)	**16·23**	221·5	252·2	500	777	1·07	2·70	0·80	3·10	12·90	26·3	49·7	4·5	·468	20·7	2·65

COALS. CLASS B.

Dessau . . .	11 hours' duration of charge. 1 hr. steam	12,340	**15·84**	(18·17)	195·5	224·3	547	675	1·73	2·10	0·50	3·90	9·20	31·2	49·4	3·7	..	11·6	3·25
	12 hours' duration of charge. 2 hrs. steam	14,010	(14·14)	**15·19**	196·8	212·8	498	698	1·62	2·36	0·40	3·12	12·20	26·3	49·8	5·8	·443	52·5	2·37

COALS. CLASS C.

Horizontal.	Ordinary	12,010	**15·12**	(17·89)	181 6	214·8	525	630	1·58	2·19	0·54	3·38	9·68	31·5	47·3	5·4	·451	32·8	5·49
	Overpulling . . .	12,830	(13·58)	**14·95**	177·7	191·8	502	645	1·69	2·68	0·71	3·27	9·81	27·3	44·6	11·6	·471	26·2	4·35
Dessau . . .	10 hours' duration of charge. No steam	12,000	**14·78**	(16·39)	173·4	196·7	494	593	1·26	2·41	0·40	3·03	9·03	28·8	52·6	3·7	·443	16·0	2·40
	11 hours' duration of charge. 1 hr. steam	12,930	(13·11)	**14·76**	169·6	190·9	490	634	1·30	2·43	0·74	2·70	12·88	26·7	49·1	5·4	·423	21·6	2·08
	11 hours' duration of charge. ½ hr. steam	12,610	**13·83**	(15·35)	174·4	194·0	494	623	1·38	2·42	0·67	2·95	11·94	28·2	49·2	4·6	·450	22·5	2·32
	12 hours' duration of charge. 1 hr. steam	13,380	(12·50)	**13·52**	166·3	181·0	477	640	1·20	2·51	0·52	2·80	13·70	26·0	49·7	4·8	·425	16·3	2·90
Woodall-Duckham.	Ordinary	11,650	**15·00**	(16·36)	174·8	190·6	526	613	1·00	2·45	0·55	2·60	11·10	30·2	45·7	7·4	..	27·0	2·74
	Coal feed rate decreased	12,010	(13·41)	**15·12**	161·0	181·6	492	591	1·41	1·63	0·48	2·50	12·78	27·6	51·5	3·5	..	29·5	3·19

TABLE No. III.—*Particulars of Thirty-Six Hours' Run (After Retorts Burnt Off) Steaming Dessau Retorts.*

Steam regulated to produce quantity of gas approximately equal to coal gas make of the installation.

Make Per Retort Per 24 Hours. Cu. Ft.	Make Per Installation Per 24 Hours. Thous. Cu. Ft.	Calorific Value. B.Th.U.		Grains of Sulphur Per 100 Cu. Ft.	Cyanide, Lb. Per Ton.	Ammonia. Grains Per 100 Cu. Ft.	Naphthalene. Grains Per 100 Cu. Ft.	Gas Analysis.							
		Gross.	Net.					H_2S	CO_2	O_2	HC	CO	CH_4	H_2	N_2
9140	165	327	301	6·0	0·83	25·9	0·7	0·81	4·80	0·35	0·00	37·85	3·0	49·2	4·8

TABLE No. IV.—*Results Showing Possibility of Obtaining the Full Value from a Rich Coal A, with a Shorter Duration of Charge by Admixture with a Poorer Coal C.*

Quality of Coal.	Test.	Conditions.		Weight Carbonized Per Retort per 24 Hours.	Make Per Ton. Cubic Feet.	I.P.		I.P. Multiple.		C.V. B.Th.U. Net.	C.V. Mult. Net.	Gas Analysis.							
		Hours of Duration of Charge.	Steaming Period.			1.	2.	1.	2.			H_2S.	CO_2.	O_2.	HC.	CO.	CH_4.	H_2.	N_2.
			Hours.	Cwts.															
A	1	12	*Nil.*	15·34	12,220	16·57	18·76	202·5	229·3	546	667	1·10	1·4	0·8	3·6	7·4	31·7	50·5	4·6
	2	12	2½	15·32	13,940	15·20	17·29	211·9	241·0	522	728	1·23	2·1	0·4	3·1	11·0	28·3	53·1	2·0
	3	13	3½	14·01	15,540	14·25	16·23	221·5	252·2	500	777	1·07	2·7	0·8	3·1	12·9	26·3	49·7	4·5
C	..	12	1	15·16	13,300	12·69	13·67	168·7	181·8	481	640	1·16	2·45	0·27	2·85	13·53	26·5	49·5	4·9
Actual mixture A 52·8 % C 47·2 %	..	12	2	15·10	14,190	14·03	15·60	**199·1**	**221·4**	498	**707**	1·15	2·8	0·5	2·9	13·0	25·9	49·5	5·4
Theoretical average of tests— A 52·8 % C 47·2 %	..	..	..	..	(14,580)	(13·51)	(15·02)	(**197·0**)	(**219·0**)	(491)	(**716**)	..	..	..	..	..	..	..	..

sumption remained the usual rate for gas making, while the temperatures of the retorts kept constant at about 1920° Fahr. The coke when finally drawn presented a honeycombed and very rotten appearance. In such times of trouble as "strikes," &c., if the means were available on the works, such a gas would be easy to enrich.

Again referring to Table II., it is seen that in coal Class A (Dessau installation), the experiment was conducted with a duration of charge of 13 hours, steam being admitted during the last 3½ hours. Twelve hours is the more usual maximum duration with Dessau retorts, and is generally the most convenient arrangement for retort-house work. The extension of the duration to 13 hours, with the extra labour costs, &c., involved, much depreciates the otherwise fine results obtained. The first steaming experiment made with this coal with a duration of the charge of 12 hours gave a comparatively small increase of make for the steaming period. Results are given for comparison in Table IV. (Coal A, tests 1 and 2).

The reason was thought to be the unusual amount of distortion of the charge taking place during carbonization. The charge is usually levelled to 2 ft. 4 in. below the top of the mouthpieces; but on investigation this coal was found to swell up 12 to 18 inches higher than this level during the first few hours, and afterwards to contract to practically its original position. By the time the charge contracted, it had left the sides of the retort by 1 inch or more—it being possible to easily thrust a rod down between the charge and the retort. The coke was of a very hard and dense quality. Pressures taken upon the bottoms of the retorts showed over 1 inch pressure for the first 2½ hours, and then became level gauge, indicating a free passage up the retort. The scale upon the lower portion of the retort was much eaten away by the action of the steam, and a rise of 20° C. in the temperature of the tar in the hydraulic main, with thickening of the tar, pointed to quantities of steam passing through the retort without any chemical change.

The test with 13-hour work, with increased steam pressure and duration of the steaming period, was accordingly made; so that the possibilities of the coal at a moderate illuminating power and calorific value might be determined—the question of economy of working not being necessarily studied. The behaviour of the coal, however, rather indicated that with this system of carbonization better results would be obtained if the coal could be, in a sense, "toned" down. A test was therefore made with an admixture of poorer coal; and it was found possible [see Table IV.] to obtain results equal in value to an average of the 13-hour test (Coal A, test 3) and the test on C coal in a duration of 12 hours, as a comparison of actual multiples obtained from the mixture and the calculated multiples from the results of the two coals will show. The figures given are the results of single experiments only; but they sufficiently emphasize the advantage of a judicious admixture of coals.

Coal Liming.

Considerable interest has been aroused by Mr. Paterson's coal-liming process at Cheltenham; and it was decided at the coal-test works to investigate the possibilities of the process from the point of view of carbonization. The results are set forth in Tables V. and VI., and have been made with two different kinds of coal on the Dessau installation, and with a third coal on the horizontal installation. The mixing was done in the manner described as in use at Cheltenham; the powdered lime being sprinkled upon the coal (in our case by hand) at the crusher, a steam-pipe being placed to play upon the buckets of the elevator as they removed the coal from the boot. The overhead coal storage hopper was entirely closed for the experiment, to prevent possibility of losses from the disturbance of dust. The coal as fed into the retorts was very well covered with lime, and was of the grey colour spoken of by Mr. Paterson; while the presence of lime in the coke produced was not obvious by inspection.

From a comparison of the yield of illuminating and calorific multiples upon coal limed and unlimed, it is seen that no practical advantage in actual gas production was obtained. It is probable that the advantage found at Cheltenham in the make of gas per ton was entirely due to the freedom from stopped gas take-off pipes experienced after coal liming. In regard to this latter question, we are not troubled with stopped pipes at the coal-test works; so it was not possible to investigate this effect. The increase in the yield of ammonia (although much lower than the 7 per cent. increase found at Cheltenham) is appreciable, and it is not altogether surprising to see this accompanied by a drop in the yield of cyanide.

Cyanogen compounds in coal gas probably occur as the result of the breaking-down of nitrogen compounds at high temperature in the presence of carbon, as may be demonstrated in the laboratory by passing nitrogen over heated carbon; as much as 2 per cent. of the nitrogen present having been found to have been converted into hydrocyanic acid.

The influence of the lime present with the coal may either hasten or aid the evolution of ammonia; a larger quantity being thus able to escape without further chemical change. The sulphur content, both in crude and pure gas, is reduced—the H_2S being reduced about 30 per cent., while grains of sulphur (CS_2 compounds) in pure gas may be said, in the case of the horizontal installation, to be for all practical purposes sufficiently reduced. The method employed for the rather difficult determination of H_2S was that a freshly taken sample of gas was tested in a gas analysis apparatus over mercury, with cadmium chloride solution as absorbent. Each analysis was carefully timed to occupy the same duration, both of period of absorption and total time. The results returned will therefore be at least comparable. They are the average of twelve individual tests.

TABLE No. V.—*Coal Liming (Comparative Results).*

Admixture of 2 per cent. of lime (added slaked) to coal carbonized.

Installation.	Per Cent. Lime.	Quality of Coal.	Charge per Retort.	Duration of Charge.	Make per Ton.	I. P.		I. P. Multiple.		C.V. B.Th.U. Net	C.V. Mult. Net	Gas Analysis.								S Grains per 100 Cubic Feet.	Cyanide.	Tar. Galls. per Ton.	Liquor. Galls. 10 oz. per Ton.
						1	2	1	2			H_2S	CO_2	HC	O_2	CO	CH_4	H_2	N_2				
			Cwt.	Hrs.	Cu. Ft																		
Dessau . .	*Nil*	A	8·03	12	11,740	15·35	17·93	**180·3**	**210·6**	526	**618**	*1·65*	*1·7*	3·3	0·4	7·7	31·8	52·0	3·1	*24·4*	*3·27*	13·6	*37·2*
	1·91	,,	8·03	12	11,780	15·24	17·59	**179·5**	**207·2**	516	**608**	*0·95*	*1·6*	3·0	0·4	8·2	31·0	51·9	3·9	*17·7*	*3·07*	13·1	*39 0*
,, . .	*Nil*	B	7 55	12	12,080	15·96	18·04	**192·8**	**217·9**	542	**655**	*2·70*	*1·7*	3·8	0·5	8·2	30·8	51·4	3·6	*32·5*	*3·43*	12·9	*36·7*
,, . .	1·90	,,	7·68	12	12,250	15·65	17·58	**191·7**	**215·4**	535	**655**	*1·90*	*1·8*	3·7	0·5	9·0	30·0	51·6	3·4	*27·3*	*2·74*	11 0	*39·2*
Horizontal.	*Nil*	C	6·50	6	11,610	15·15	17·14	**176·0**	**200·2**	557	**504**	*1·81*	*3·1*	3·7	0·6	12·2	27·3	45·7	7·4	*52·6*	*6·15*	13·4	*34·8*
	2·0	,,	6·47	6	11,750	15·03	17·24	**176·6**	**202·1**	553	**502**	*1·32*	..	..	..	..	..	..	..	*18 3*	*5·20*	13·7	*36·2*

TABLE VI.—*Total Effect of Coal Liming.*

Product.	Dessau (Average of Two Tests).					Horizontal (One Test).				
	Unlimed.	Limed.	Difference + −	Per Cent Difference.	Approximate Value per Ton.	Unlimed.	Limed.	Difference + −	Per Cent. Difference.	Approximate Value per Ton.
					d.					d.
Ammonia (gallons 10 oz. per ton) . . .	37·00	39·10	+2·10	+ 5·7	+2·04	34·8	36·2	+ 1·4	+ 4·0	+1·36
Cyanide (lbs. per ton)	3·35	2·91	−0·44	−13·1	−0·35	6·15	5·2	− 0·95	−15·4	−0·76
H_2S in crude gas	2·17	1·43	−0·74	−34·1	+0·89	1·81	1·32	− 0·49	−27·1	+0·59
CS_2 in pure gas.	28·50	22·50	−6·0	−21·1	+0·84	52·6	18·3	−34·3	−65·2	+4·0
CO_2 ,, ,, ...	1·60	1·75	+0·15	+ 9·4	..	3·28	3·50	+ 0·22	+ 6·7	..
Coke (increased by 3·1 per cent. by addition of 2 per cent. lime to coal). Value of coke assumed to remain the same .	..	..	..	+ 3·1	+2·17	..	..	..	+ 3·1	+2·17
				Total . .	+ 5·6				Total . .	+7·4

Approximate cost of coal liming—

	Per Ton. d.
Labour, &c.	3·5
Lime 2 per cent. at 13s. per ton	3·1
Total.	6·6

Comparative analysis of coke produced—

	Unlimed.	Limed.	Increase by Liming.
Ash . .	9·60 per cent.	.. 13·90 per cent.	.. 4 30 per cent.
Sulphur .	1·28 ,, ,,	.. 1·47 ,, ,,	.. 0·19 ,, ,,

The reduction in grains of sulphur in the case of verticals may not be so great in proportion as the reduction shown in horizontals, owing to there being much less present in the first instance. It is found with the vertical retorts that the grains of sulphur present in pure gas are generally sufficiently low for most requirements. The small increase of CO_2 is possibly caused by the presence of carbonates in the particular lime used. Some small pieces of lime were placed in one of the charges to a horizontal retort, and were later detached from the coke produced and examined. The calcium oxide was converted into calcium sulphide with a trace of calcium sulphate. The coke produced by liming is increased in weight, of course, by approximately 1·5 per cent. for every 1 per cent. of lime added to the coal; the whole of this increase being an addition to the content of ash, while the sulphur content is also increased. The fluxing qualities of the ash or clinker will, in most cases, be increased, although this was not apparent when we used the coke in the producers, &c. Cheltenham is able to maintain the full market value for this limed coke—thus deriving a direct benefit upon their coke sales; but there is little doubt that where coal is used in which the ash is ordinarily high, the additional ash due to the liming of the coal, added to the increase of sulphur, would probably bring about complaints, and necessitate a drop in price.

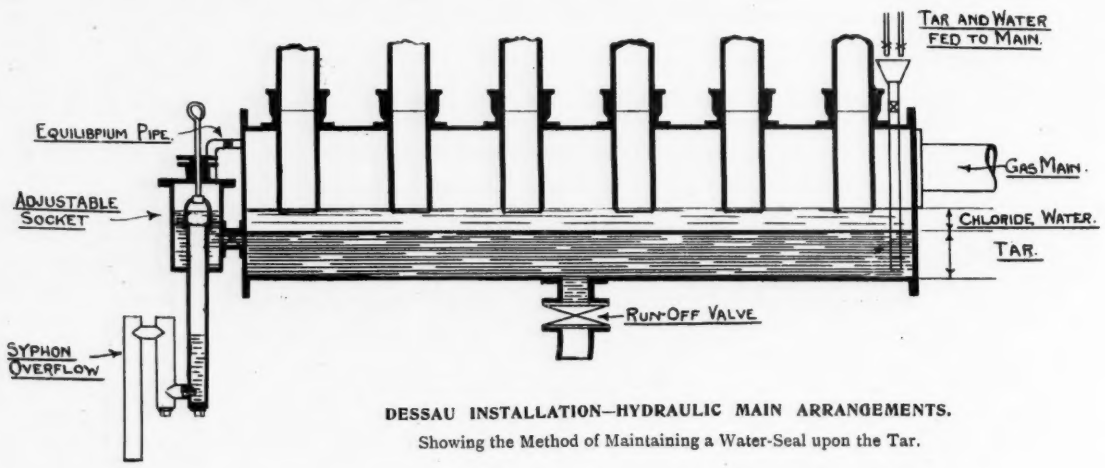
An attempt has been made in Table VI. to approximate a money value to the difference in yield of various products brought about by the process; and it is evident that there is little to be gained by coal liming unless it is essential to reduce the grains of sulphur in pure gas, as is the case at Cheltenham. If the latter be the case, then probably liming would be a very convenient and economical means of effecting the needed reduction, especially if the objectionable and expensive use of sulphided lime is the alternative.

Ammonium Chloride.

Mention has been made in recent publications of the trouble caused by the presence of chlorides in coal during carbonization. We are of opinion that although most of the corrosion of the retorts may be due to the presence of sodium chloride, it is the total soluble salts, and not necessarily chlorides alone, that are doing the damage. So far we have met with no reliable data on the subject; but we are convinced, from what little experience we have already had, that the simple presence of chloride is not a true indication of the possible corrosive effect of the coal on the retorts.

We have had many analyses of coals for chloride usually expressed as percentage of sodium chloride; but we find that from well-taken samples of the same coal (taken from different deliveries) the percentage of chloride may vary by over 100 per cent. This is probably due in some cases to bad washing of coals at the collieries, the same washing water being used more than once, and becoming gradually more concentrated in soluble salts.

The members of the Association will be interested to hear that, in the course of experimental work, which included an accurate determination of the distribution of chloride over the coke, tar, liquor, and gas, compared with that originally present in the coal, we have adopted a very simple means of eliminating a large percentage of the chloride from the gas in the hydraulic main, and have the means of keeping it separate from the main body of liquor subsequently condensed.



DESSAU INSTALLATION—HYDRAULIC MAIN ARRANGEMENTS.

Showing the Method of Maintaining a Water-Seal upon the Tar.

On our intermittent vertical test plant, we have usually worked with no seal, but anti-dips, and have endeavoured to remove the pitch by circulating tar through the hydraulic main and working a stirrer through its whole length. Our experience showed that, to keep the main clear, the stirrer had to be worked a little every hour. On examining the pitch formed, we found that the chief binding material was ammonium chloride, the latter having formed a crystallizing solution with the water of the tar. It occurred to us that if this chloride could be kept out of the tar, pitch troubles would perhaps be reduced, if not completely obviated.

Hence it was arranged to run both water and tar through the hydraulic main, and arrange the overflow so that a 3-inch layer of water should be maintained on the top of the tar, the dip-pipes thus having a half-inch water or liquor seal. By running the water in hot, little free ammonia was taken up, and the chloride in the gas passing from the hydraulic main was reduced. We were then able to run for a period of six weeks without the use of the stirrer before pitch accumulations appeared, whereas three days has previously been the limit.

Under these conditions, liquor of the following composition was obtained:—

Twaddel at 60° Fahr.	6·0	.. Sp. Gr.	1·03
Total NH_3	= 2·53 per cent.		
Free ,,	= 0·28 ,,		
Total chloride stated as NH_4Cl	= 6 03 ,,		

showing that about 88 per cent. of the fixed ammonia was present as chloride; the remainder being present as sulphocyanide, sulphate, and sulphite.

A sketch of the overflow arrangement in the hydraulic main is shown above. It is quite a question whether the ammonium chloride so separated can be worked-up for ammonium chloride crystals. The requisite concentration, and the removal of the impurities, sulphocyanide, and traces of iron, may be too costly a process. This question we are investigating.

In concluding, we wish to acknowledge the kindness of the Gas Committee in allowing us to present this paper and show you over the works to-day.

DISCUSSION.

The President (Mr. W. H. Johns, of Malvern) remarked that they were all very pleased to see Dr. Davidson, the Engineer of the Nechells Works, at the meeting; and he would ask him to open the discussion.

Dr. W. B. Davidson said he wished to tell them in the first place that it had been a great pleasure to those connected with the Nechells works to welcome them to see the new installation of Dessau retorts. But, honestly speaking, they would have preferred that the visit should have been delayed a little longer, because they had really only just put the retorts into operation; and the two benches that had been started-up had been got to work in a great hurry, in order to make the gas that was necessary. There were thus many things that were not yet working quite sweetly. If they came again in two months' time, they would probably find things in quite a different condition. He hoped they had profited by their visit to what was the largest installation of the latest model—the 1912 model—of Dessau settings. It differed only very slightly from the test plant setting—chiefly in size. But 10 or 15 per cent. increase in charges made a considerable difference, they found, in the temperature of the gases leaving the retorts, the conditions in the hydraulic mains, and so forth. With regard to the paper, in his opinion it was a most useful one for everybody to read; and it was particularly useful to those who studied the testing of coals and the different carbonizing systems. It would be inferred from the paper that candle power testing was very unsatisfactory. When one considered the large number of ways of testing for illuminating power—not only the quantity of test-burners, but the different methods in which these various burners could be used—and the results of these tests, one could not but have a feeling of great disgust, from a scientific point of view, with the whole thing. Now he would much like to offer a little mild criticism of the paper—with regard to some of the curves particularly. It did not seem to him to be quite fair—or, at any rate, it was rather incomplete—to select the 17-candle distance as the only distance. One could very often get a better test at the 19 or 20 candle distance. This particularly applied to carburetted water gas. The test showing the amount of ammonia in the gas made by pure steaming in Dessau retorts was one which he thought should be

confirmed. It seemed to him very doubtful whether they could have the formation of any ammonia at all under the conditions named. Otherwise they should expect to get ammonia in making water gas, because the conditions were practically the same. They had the coke at a temperature at which he thought it was not possible for ammonia to exist. However, he believed that what he referred to was only one test. He would suggest that, if any opportunity should arise in the future, the test should be repeated for confirmation, because if the result shown proved to be correct, it would be a very valuable asset in the steaming of the charge in the vertical retort systems.

Mr. G. B. JONES (Coventry), alluding to the liming of coal, said they had carried out a test of this process for a month at Coventry. They put half their retort-house under it, and used 2¼ per cent. of lime. Many of those present would be aware that at Coventry they suffered from a very high sulphur rate; their average having been from 80 to 90 grains. They had therefore had to go back to lime purifiers to get it down. In the test, they found that by using about 2¼ per cent. of lime, they could reduce the sulphur to some 45 grains. But, as might have been expected, they had trouble with the coke. It was noticed that the producer lining was being attacked, and that the clinkering of the furnaces had to be done much more often. There was also some trouble in connection with the breeze for their power boilers. This being so, of course, they assumed that the people who used the coke would have the same trouble. However, they did not actually have any complaints. Now that they had gone back to lime purifiers, they got the sulphur down to about 25 grains.

Mr. E. H. WRIGHT (Wolverhampton) inquired as to what kind of flat-flame burner was used. He said he had had a little experience of testing; and he found there was a lot of difference with various kinds of burners. He himself had principally used Bray's. Also the differences which he had obtained between the No. 1 and the No. 2 burners were much greater than those shown in the curves—by 1½ candles at the very least.

Mr. S. E. WHITEHEAD (Windsor Street), referring to Table IV., showing the results of mixing a poor coal with a high-class coal, asked whether any figures were available as to coke. It seemed it might be possible to mix a caking with a non-caking coal.

The PRESIDENT said the paper was one that presented great opportunities for discussion; and he had hoped that more of the members would have spoken. The authors were to be congratulated upon the large number of valuable figures which they had brought forward. Not only the Association but the industry at large, would find the paper of very great benefit at the present time. As they were all aware, the question of carbonizing was at the moment receiving very careful consideration by the majority of gas managers; and difficulty was found in installing, or in deciding upon the adoption of, the system which would be most likely to meet their particular requirements. With the paper in their hands which had been submitted that afternoon, he thought that many of the difficulties with which these managers had hitherto been faced would be readily overcome. Even if this were the only benefit to be derived from the reading of the paper, he was sure the authors would be fully repaid for the trouble they had been to. The question of calorific value was a very important one at the present time; but there was the matter of candle power also to consider. He believed the authors said that certain people should be provided with a gas of between 16 and 17 candles, owing to the fact that there was a difficulty in getting some of the old gas consumers to adopt incandescent burners. To a certain extent he agreed with this view, because during the short time he had been connected with the Malvern Gas-Works, they had experienced very great difficulty in getting people to adopt incandescent burners. Therefore he was handicapped in reducing the illuminating power. This being so, it seemed to him that, when they were considering the adoption of new carbonizing units, it was still necessary to take into account not only the quality of the gas from a calorific point of view, but from an illuminating point of view as well. He was quite aware that the Gaslight and Coke Company were going to Parliament in the next session asking for the illuminating power standard to be entirely removed from their Act, as they wished to test the gas in future only under calorific conditions. But he was one of those perhaps rather old-fashioned people who continued to believe in the adoption of the two tests—illuminating power and calorific value—inasmuch as flat-flame burners were even now desired by some people. It therefore occurred to him that the working of horizontal retorts still had a claim upon their attention. The great advantages no doubt of the vertical systems were in respect of the labour charges; but looking at the figures given in the paper, he found, from the multiple point of view, that the horizontal figures were even better than some of the results obtained from these new installations of vertical retorts. He would like to congratulate the authors upon obtaining a yield of 15,540 cubic feet per ton from the Dessau retorts. It was a really remarkable make. With regard to the mixing of coals, he considered this, though the authors had said very little about it, one of the most important parts of the paper. At a certain gas-works with which he was connected some years back, a very great point was made of the mixing of the coals. It was, of course, a fact that in some works coal had to be carbonized directly it was received, and no means were available for mixing. A considerable difference in the quality and make was then noticeable from day to day. But where the coal-stores permitted of it, the unloading could be so arranged that a day's supply of coal would be deposited over one crusher to be used the following day; and the coal used for carbonizing on any particular day would be that received on the previous day. Taking a retort-house with a coal-store on either side, and four coal-breakers and elevators, the left-hand crusher on one side would receive coal one day, and the right-hand crusher on the other side. Working two crushers each day cross-cornerwise, the coal could be so mixed—if they had turntables over the crusher pits—as to equalize the quality of gas they desired to produce from it. The two crushers, one on either side of the retort-house, would be crushing coal for the day's requirements which had been dumped on the previous day. There were other methods of coal mixing; but the plan adopted depended upon the formation of the site and the general arrangement of the gas-works. In this way, a much more even quality of gas could be made than if the coal was taken and carbonized directly it was received at the works. He could confirm what the authors had had to say about coal liming. When he was engaged at Saltley, they found there was no doubt that the sulphur in the gas was partially eliminated by this process. He never noticed that the coke—at any rate, so far as could be seen by the naked eye—was at all affected, though he quite agreed that it must have had some action on the furnace bars and linings. However, as they thought the expense of mixing was too great, they did away with the process before it had been at work long; and therefore he could not say whether the lime in the coke would have a very marked effect on the bars and linings. The authors referred to Cheltenham, where the make of gas was reported to have been increased by the use of lime. Personally, he did not see how this could be. The authors put forward the suggestion that it was probably due to the freedom from stopped pipes. What he knew of the Cheltenham works was that they had always been in the habit of getting a good make per ton; and he believed they had always obtained a small number of stopped pipes, due to the fact that they worked with a dry seal, and so did not get the oscillation on the dip-pipe that one would working with a hydraulic main. In conclusion, he proposed a hearty vote of thanks to Messrs. Smith and Pearson for their interesting paper. Possibly the members had been a "little previous" in their visit to the Dessau plant; but there was more to be learnt, from a student's point of view, if things were not going altogether smoothly.

Mr. F. J. WARD (Knowle), in seconding the vote, remarked that the paper was one which could be read at leisure, but so far he himself had not had this leisure. There were, however, just one or two points which had been touched upon by previous speakers which he would like to refer to by way of corroboration. The President had stated that since he had found himself installed in another atmosphere, he had discovered that he was dealing with consumers. He had also found that when he was dealing with superiors, and in a gas-works simply, he had different ideas from what he had now. He was progressing. [Laughter.] Personally, his (the speaker's) experience was that it was absolutely necessary that they should supply a gas that would give a certain illuminating power with the best flat-flame burners. Of course, there were flat-flame burners and flat-flame burners. They could have burners that would give ½ candle per cubic foot consumed at the 5 feet rate, assuming that the gas was 16 candles by the No. 2 burner; and they could have one that would develop a light of 2 candles. When he had to supply burners, he used Bray's double adjustable, Nos. 2, 3, and 4, with No. 8 or 9 top, which gave a good light. In the Parish Church at Knowle, he had the greatest difficulty in persuading the churchwardens to adopt incandescent burners; they would have flat-flame ones. Though he had now succeeded in getting the nave lighted on the incandescent system, there were still flat-flame burners in the chancel. This would show them the difficulty he had. Personally, he was interested in the Dessau retorts, because even in a little place like Knowle he had his labour troubles. It seemed to be the spirit of the day that if the ordinary working man read in his paper that people in other parts of the country were in a state of unrest, he must be the same himself, if only out of pure sympathy; and though the Knowle works were so small, he would like to put up an installation of vertical retorts, and so free himself to a large extent from labour troubles. One thing that had to be borne in mind was that it was necessary, for horizontal hand working, that a man should be of good physique. It was useless to take a man under about 5 ft. 6 in. in height; and as the tendency to-day was that men were becoming smaller, they could not find the same number of men of the requisite height, and so the choice was becoming more limited. He would like to ask the authors whether steaming the charge reduced the heat much; also whether it reduced the weight of coke, and if so to what extent. Dr. Davidson had made a statement as to a difference of 10 or 15 per cent. in the size of the charges; but he was not sure which way it was.

Dr. DAVIDSON: The new one is the larger unit.

Mr. WARD (in conclusion) said there would be one great difficulty with him in installing vertical retorts. He was situated in a residential district; and as the retort-house had to be a considerable height, he was afraid the people would object—as they did even to the raising of the height of a chimney.

Mr. SMITH (after acknowledging the vote of thanks, which was heartily accorded) said he was very pleased to see the members, and was also glad that Dr. Davidson had been able to come to the meeting. They owed a lot to him. The more testing they did, the more they realized how absurd were the comparative figures to be got from the illuminating power tests with various

burners. As practical tests, they were really valueless from the gas consumer's point of view. He was not at all surprised that Dr. Davidson should that afternoon raise the question of the increase of ammonia due to steaming the coke. He (the speaker) quite agreed with him when he said it was advisable to carry out confirmatory tests on a point like this. As a matter of fact, however, the tests were not undertaken to find out this; but they happened to show it. Whether it was picked up in its passage through the plant, or was due to actual formation of ammonia in water-gas production, they could not say. He did not see any reason for definitely asserting that the latter was impossible. It seemed to him to be feasible; but he had no facts to prove it, just as there was nothing to prove that it was not possible to produce ammonia with the conditions under which this test was made. As to Mr. Wright's remarks, they could not help getting different results from different gases. They were up against the proposition now in Birmingham of having to account for discrepancies. They were putting up vertical retorts all round; and it was of importance to make a calculation of the calorific value of the gas and compare it reasonably with the determined calorific value. In horizontal working, where they had got used to the gas, and knew fairly accurately the hydrocarbons, it was easy to get within a fair number of B.Th.U. The difficulty in doing so now could only be due to the big difference in the hydrocarbons —not being able to say what the hydrocarbons were. It was a difficult matter to examine; but they were examining it. Mr. Whitehead had asked a question about mixing non-caking with caking coals. They had tried this. They had used mixtures of Welsh steam non-coking coal and moderately good coking coal; and quite decent coke was produced. There should be no difficulty in this way, if the matter was studied properly. He was very glad to give the paper in conjunction with Mr. Pearson, who was a most enthusiastic and able assistant on the test plant. He owed a great deal to Mr. Pearson and his ability in running the plant and carrying out the necessary experimental work of various kinds.

Mr. PEARSON said that one or two points had been left for him to answer. Dr. Davidson expressed the opinion that it was a pity that the curves were only made in the case of the coal gas with the 17-candle distance. There was no doubt it was a pity. It would be interesting to have tests at different distances to compare. But, as a matter of fact, they had not carried out any experimental work specially to construct these curves. They had simply taken tests which they had over some eighteen months, and made curves from them. They were fast coming to the conclusion that illuminating value was not worth experimenting on; and from their point of view, so long as all the tests were made in the same manner it was quite sufficient. The experience of liming at Coventry was interesting; but he did not think it would surprise them at all. The amount of lime mentioned—2¼ per cent.—struck one as being very heavy. Was it weighed quick or slaked?

Mr. JONES: Quick.

Mr. PEARSON remarked that this was heavy. No doubt the type of coal had to be taken into account. It seemed to him that the fact that the coke was made to attack the producers pretty well condemned the process. He did not mention whether the ammonia was increased or decreased. This was rather an interesting point.

Mr. JONES: We did not take any tests. We had no means of separating the liquors in any way.

Mr. PEARSON (continuing) remarked that the President had said he believed it was stated in the paper that 16 or 17 candles should be maintained. As a matter of fact, they had not actually made such a statement at all. They left it for other people to deduce. What they meant was that a large quantity of gas had necessarily to be burnt in flat flames—not because people would not be educated up to incandescent burners, but because in such places as machine shops, for boiler riveting, &c., where lights had to be moved and used near hammering work, nothing but a flat flame was easy to employ. As therefore the quantity of gas actually used as flat flames was heavy in percentage on the total gas sales, these people had a right to demand a decent illumination for the purpose for which they used the gas. He would point out that the Washington Bureau of Standards, in a circular recently published, recommended that a dual standard be introduced—illuminating power with flat flame and calorific value gross. Mr. Ward had asked whether steaming the Dessau retorts in any way reduced the heat. They reckoned that it reduced the temperature of the retort approximately 100°. The coke formed was about 15 lbs. less for every 1000 cubic feet of water gas made in the Dessau verticals.

Collapse of Groined Arches.—A report by Mr. John H. Gregory, of New York, upon the collapse of the roof of a filtered water reservoir at Baltimore, on Oct. 20, ascribes the failure to the premature loading of concrete arches with earth-filling, without provision for taking-up the thrusts. After careful investigation, it appeared that, regarding the reservoir as a finished structure, the engineering design was sound, and the materials employed were satisfactory. As the loading of the arches was begun at one end of the reservoir before those at the other end had been completed, there was no provision for taking-up the thrust; the result being that some of the groins fell while they were acting as cantilever beams.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

A Meeting of the London and Southern District Junior Gas Association was held on Friday evening, at the Westminster Technical Institute, Vincent Square, S.W.—the PRESIDENT (Mr. S. A. Carpenter, of the North Middlesex Gas Company) in the chair. The business portion of the proceedings, and the social intercourse during light refreshments which followed, both proved thoroughly interesting to the good muster of members and patrons who were present.

An Address by Mr. Charles Carpenter, D.Sc.

The PRESIDENT remarked that Mr. Charles Carpenter, who was well known to them as the Chairman of the South Metropolitan Gas Company, had for a long time been one of the patrons of the Association; and he was now going to give them an address. No doubt the subject he had chosen would afford them ample food for thought.

Mr. CARPENTER (who was greeted with applause on rising) then delivered the address which will be found on p. 873 of this issue. At its conclusion,

The PRESIDENT said they had listened to an address which was certainly full of wisdom and shrewdness. The suggestion that a gas engineer should spend a certain portion of his time in a shop seemed to him to be quite a new idea; but he felt there was a great deal in it. Much emphasis had also been laid on the study of men. This was, of course, of the first importance; for however good a machine might be, it would fail in its purpose if the man was not doing his part. It needed a considerable amount of observation to enable one to pick out the right man for particular work.

Mr. F. S. LARKIN (Gaslight and Coke Company), in proposing a hearty vote of thanks to Mr. Carpenter, remarked that there was no need for him to say how grateful the Association were for the address. There was no doubt that, especially to the younger members of the profession, the advice given would prove extremely useful. Anybody who had risen to the height that the lecturer had must be well versed in the management of men; and it was a subject which one could talk about for a very long time. No doubt, all of them made mistakes at one time or another; but he thought they learned more from their mistakes than from the things which were done correctly. The question of the training of the junior engineer was a matter in which he personally was greatly interested. In this connection, it was gratifying to him to know that a scheme which he started some time ago had borne good fruit. Of course, as a general rule, people were under the necessity of earning a certain amount of money while learning; but with the advantages now afforded for technical education, he thought that the majority of those who served their time in the shops and zealously attended evening classes, and lectures like the one they had just heard, would, when they reached the age of 24 or 25, be able to hold their own against the ordinary run of university trained men. He had often been asked what should be done with a boy. The first thing to do when he left school at about the age of sixteen was to put him through the shops and train him as an engineer. It did not matter what calling a youth might afterwards take up, if he had been trained in engineering it would give him a stamina which it seemed to him could not be found in any other branch of industry. Some reference had been made in the address to the taking by employees of grants in any shape or form other than their correct salary. He thought all of them at some time or another had seen the effect of this—that the man who did it must come to grief. A man who went straight to his work, and did it well, had cause for satisfaction; but one who tried to get a little bit more gain by some means or other outside was doomed to failure. As to drinking and smoking over business, he thought all those who went about the City would have noticed in the last few years much improvement in this respect. A great deal of this business was now done in the numerous tea-shops which provided an alternative to the public house. When he was first put into a responsible position, a chief for whom he had great respect gave him this advice: "Whatever you do, try to use the Company's money as if you were spending it out of your own pocket." He thought no better advice could be given to any young man starting in a position of responsibility. As to imagination, this was the most important point, provided they safeguarded it with caution. Sometimes imagination was allowed to run away with one; and it was to prevent this that caution was necessary. The more they delved into things, the more they found they did not know.

Mr. E. W. BROWNING (Gaslight and Coke Company), in seconding, expressed the opinion that the Association were very much to be congratulated upon having been favoured with one of the best and most concise addresses he had ever listened to. If they remembered the principles and precepts that had been laid down, and tried with all their ability to put them into force, it would make of them better men. He had been much struck with Mr. Carpenter's hobby, which was very similar to his own. He (Mr. Browning) had all through his life cultivated the study of human nature, which he regarded as one of the most fascinating and interesting things a man could devote himself to. The reference in the address to the powers of imagination had much impressed him, because in his experience imagination seemed to be very

much lacking in the youths who emanated from the County Council technical schools. Whether or not the training destroyed the powers of imagination, he did not know; but he found it a fact that they were lacking. As an illustration of the possession of these powers, the example had been cited of the Engineer who designed Euston Station. The same could not be said for the men who conceived the gas industry, because the one great thing which had puzzled him all his life was why the pioneers of the industry in London should have built their works at Westminster, Brick Lane, and Curtain Road, where every bit of coal had to be carted in waggons to the retort-house. He had, however, lived long enough to know that, as the industry developed, the power of imagination developed too; for when he (the speaker) was a boy, the late Mr. Frederick John Evans conceived the great station at Beckton, and so provided for the undertaking to the present day. Evans, he claimed, was one of the men who had great imagination in the gas industry, and so he was able, seconded as he was by that great administrator Mr. John Orwell Phillips, to overcome every difficulty. One thing which the study of mankind would do was to make them tolerate others. It would enable them to see things as others saw them. One of the great points they should always remember was that before they attempted to bring their own judgment to bear on matters, they should look on the other side. They should have regard for the "other fellow's" view before they came to any conclusion of their own. If they made a practice of doing this, they would never be in a difficulty, because once they had in their own minds obtained the benefit of the "other fellow's" view, the remedy was easy. It would, as he had said, also make them tolerant of other people. It would make them remember they were not all built in the same mould, and give them sympathy for others who had not so much experience as themselves.

"Let each man learn to know himself,
And for that honour labour;
Let him his own faults first discern,
Ere he condemns his neighbour."

The vote having been carried by acclamation,

Mr. CARPENTER, in response, said that any doubt he might have had as to a proper subject for the short address he had delivered that evening had been dissipated by the kind remarks of the speakers and the manner in which the vote of thanks had been accorded. It was specially gratifying to have Mr. Browning's appreciation of the point of view taken in the address. The importance of imagination, he thought, could not be gainsaid; and with regard to this, environment was one of the most important accessories. It might interest them to know—there was always a great deal of good fortune, it seemed to him, in these matters—of one of the steps which he looked back upon to-day as having helped him to achieve his position of responsibility in the South Metropolitan Gas Company. The station with which he was associated had the credit of making the smallest amount of gas per ton of the whole Company; and when he was given charge of the works at the age of 24 (about which no one could have been more surprised than he was), he thought that he must do something in order to get the make of gas right. How was it to be done? After the day's work was finished, he used to go up to the retort-house and study stoking and carbonizing. The retort-setting in those days was what was known as the chamber setting, which was extremely fashionable 25 or 30 years ago, though he did not suppose that most of those present knew it to-day. The formation of the setting was such that the heat was not equally distributed; and the retort had, as it were, three zones, or degrees of heat—minimum, medium, and maximum. The scoop used in those days for charging put the coal in evenly over the three zones of heat; and with these conditions it was impossible to get the best results. Under the circumstances, it occurred to him that the best plan would be to make a scoop which would pretty well represent the heat variations of the setting; and so he had one made of such a shape that a large, medium, and small dose of coal would be put respectively in the three different heat zones of the retort. This laid the foundation of his fortunes as a gas engineer, because it was not long before the improved working became apparent. In fact, the result was that, without any alteration of the settings, he was able to bring the make of gas from being the lowest up to the highest. He gave this as an example of what could be done by going about and absorbing the problems that had to be solved. If they did so, an inspiration was almost sure to come. The illustration was interesting, because in so many cases there was a temptation on the part of an engineer to say, "Well, now, we must go in for brand new retort-settings." Livesey was an excellent teacher in this respect. He often saw stated how much money an engineer had spent on his works; and he used to say it would be a much better testimonial in many cases if they would state how little had been spent. In the matters about which he (the speaker) had been addressing them, he had let them into the secrets, because he that day held a different position from that which he had occupied for many years, and which most of those present now held. The hints he had endeavoured to give were ones which he hoped would be valuable to them, because they might not perhaps pick them up or think of them in the ordinary course of their lives. After all, there was not very much accident in the affairs of men. Most of those in authority were watching the men coming along, and were seeing what they were doing; and what he had tried to give them in a few words that evening had been to afford them some idea of what went on in the minds (say) of the directors of an undertaking. If anything he had told them should prove helpful, he could only say that he would be very fully repaid indeed for any little trouble he might have taken in putting his ideas together. He thanked them very much for the hearty manner in which they had received the vote of thanks, and for the way in which it had been proposed and seconded.

Presentation to the Late President.

The PRESIDENT said he had now the pleasure of presenting to Mr. Winslow, last year's President, a framed copy of a vote of thanks which was passed at the end of the session. The resolution was as follows:

"This annual general meeting of the Association desires to acknowledge and place on record its appreciation of the valuable services of Mr. D. J. Winslow in conducting and promoting the affairs of the Association during the past year as President, and upon his relinquishing that office to wish him every success in his future career. His services antecedent to and during his term of office as President have contributed very largely to the prosperity of the Association; and the members desire to tender him their sincerest thanks."

S. A. CARPENTER, President.
ERNEST SCEARS, Hon. Secretary.

In Mr. Winslow they had a President who was a very careful and patient investigator. His Presidential Address revealed the fact that he possessed what was considered to be one of the attributes of genius—an infinite capacity for taking pains. He had set an example in research work which it was to be hoped would be emulated by many members of the Association.

Mr. J. G. CLARK (Gaslight and Coke Company), in seconding, also reminded the members of the great debt of gratitude they owed to Mr. Winslow. The chair of the Association was pleasant to occupy, but it carried with it a good deal of responsibility. If they remembered how well Mr. Winslow had performed the duties during his year of office, they would all agree that he deserved the best thanks they could give him.

Mr. WINSLOW, in returning thanks, suggested that another qualification might be added to those put forward in the address they had been listening to—that a man should occupy the presidential chair of their Association. It was an excellent training-ground. He wished to thank the Council and members for the support they had given him, and the patrons and seniors who did so much for the Association.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The Monthly Meeting of the Association was held on Saturday, in the Fuel Department of Leeds University, and was devoted to an informal discussion on "The National Gas Exhibition: Its Exhibits and its Lessons." A number of the members who had been either attendants or visitors related their experiences and impressions, and particularly dealt with the exhibits that had most appealed to them. Those present who had not had the privilege of visiting the exhibition were greatly interested in the novelties thus described to them. A number of these were on view—some lent by the makers, others borrowed by members out of the stock of the gas undertaking by whom they were employed. This was a special feature of the meeting. In connection with some of them, Mr. W. B. M'Lusky, the Halifax Gas Engineer, gave an interesting talk on sundry matters relating to lamps, gas, and illumination, which was all the more welcome because unexpected and spontaneously given.

The meeting closed with the making of a presentation to the Secretary, Mr. E. Garsed, in celebration of his wedding.

After the proceedings, the members took full advantage of the unusual opportunity of seeing a large town struggling to do its Christmas and week-end shopping with unlit streets and a supply of gas that was almost non-existent. The strike of municipal workers, elsewhere recorded in our pages, led to the unusual sight of an electric supply fully maintained while the gas supply had practically failed. Shops lit by candles and lamps side by side with others brilliantly lighted by electricity (all the more noticeable as the streets were in darkness), formed a rather gruesome and unwelcome sight to gas enthusiasts. Particularly unwelcome were such spectacles as stations, &c., which had been temporarily fitted up with electric light during the interval between their arrival and departure from Leeds, and other places where acetylene and oil blast-lamps were making good the failure of the gas supply. Of course, uppermost in the minds both of visitors and citizens was the wonder as to how long it would be before the electric supply was also struck at and brought to a standstill. We have not yet heard whether any of the members volunteered for an evening's work as amateur stokers at the Leeds Gas-Works.

Recent Wills.—Mr. James Lister, of West Derby, Liverpool, lately a Director of the Liverpool United Gas Light Company, whose death was recorded in the "JOURNAL" for the 4th ult., left estate of the gross value of £172,331, of which £167,733 is net personalty. The late Mr. Charles Wooldridge, the Secretary of the Winchester Water and Gas Company, left estate of the gross value of £7827.

MIDLAND JUNIOR GAS ASSOCIATION.

Those members who decided to devote last Saturday afternoon to the work of the Association were well repaid for their choice; but unfortunately it was not a very large muster—probably in consequence of the splendid weather rendering other attractions irresistible. The arrangements made were for a visit to the Birmingham coal testing works and the Dessau vertical retort installation at Nechells, and then for the reading and discussion of a paper. Those who acted as guides during the tour of inspection included Mr. E. W. Smith (Chief Chemist), Mr. G. C. Pearson (Superintendent of the Coal Testing Works), Mr. T. Brooke (Superintendent of the Nechells Works), and Mr. H. E. Stone (Assistant at Nechells).

The Dessau Vertical Installation.

The members met at the entrance to the Nechells Works, and proceeded at once to the retort-houses, one of which is filled with inclines, while the other has been devoted to a large new installation of Dessau vertical retorts. These latter being the object of the visit to the works, the time at disposal was devoted to an inspection of them. Later, during the discussion on the paper, Dr. W. B. Davidson (the Engineer of the Nechells Works) pointed out that the retorts seen working had only just been started-up, and had been got to work in a great hurry owing to the demand for gas, so that there were many little details yet to be attended to. He added that it was the largest installation of the 1912 model of Dessau settings. There are three benches, each containing five beds of eighteen retorts; but only two of these have so far been put to work. The other will be ready very shortly. In one, steaming is carried out during the last hour of the twelve over which the charge extends. One range is working with Dr. Davidson's anti-dip; and the others will probably be similarly fitted. The tar for the hydraulic mains is treated in a separate plant, for the removal of the chloride; and in the hydraulics, stirrers are used. The visitors were taken up to the charging stage, and saw some of the retorts filled. It was pointed out that before the coal is put in, a small measured charge of breeze is placed in the bottom of the retort. The excellent character of the coke produced was remarked upon. It is brought out of the house by conveyors, elevated, and screened into overhead hoppers, from which railway waggons can be operated. Some particulars of the small Dessau installation at the test works are given in the paper read at the meeting; and it was stated by Dr. Davidson that the principal difference between this setting and the larger ones at Nechells is that in the latter the charge is increased by 10 to 15 per cent. It was early last February that the Council agreed to the Committee's proposal to put up at Nechells this Dessau installation, of a capacity of 3 million cubic feet per day.

The Coal Testing Works.

Proceeding to the coal testing works, the Dessau setting erected there was inspected, as well as the setting of Woodall-Duckham verticals. There is also a horizontal retort house, in which the members spent a little time admiring some wonderfully even hand charging that was being done. A point about these three carbonizing plants (which are equal to the highly respectable make of 250 million cubic feet a year) is that the gas from any one of the plants can be passed through the one set of purifying and washing apparatus provided, while that from the others is condensed and passed to the Nechells Works to assist in supplying the city. This, of course, makes it possible to run all three plants continuously, without closing-down two while the third is under test. As a matter of fact, at the present time the whole of the gas from the Woodall-Duckham plant (equivalent to the make from about 18 tons of coal per day) is being treated by liquid purification—in connection with which, as remarked in the paper, the energies of all associated with the test plant have for some time been largely spent. The experiments were commenced by Dr. Davidson when he was Chief Chemist; and note will be made of the fact that very interesting data are now being compiled of the work, which is nearing completion. The laboratory was noticed to be well equipped with testing and recording instruments, and altogether it was easy to see that a busy time is spent by those engaged in the works.

At the close of the inspection, the members adjourned to the mess-room on the works, to hear a paper on the "Coal Test Works," by Mr. E. W. Smith, M.Sc., and Mr. G. C. Pearson. The paper, and the discussion upon it, will be found on p. 876.

A Vote of Thanks.

The President proposed an omnibus vote of thanks—to the authors of the paper, to those who had shown them round the test plant and the Dessau installation, and to the Gas Committee, Mr. Hilton, and Dr. Davidson for allowing the visit to the Dessau plant at this particular time. They were all aware that troubles would occur in connection with new installations; but it was just what they wanted, to see the difficulties. At the same time, he would like to congratulate Dr. Davidson and all those connected with the plant upon what he considered was the very smooth running of so large an installation of Dessaus, bearing in mind the time taken in getting the work together under difficult conditions, due to strikes and other causes. The installation seemed to be working very well indeed, taking into consideration all the drawbacks that had had to be contended with.

The Vice-President (Mr. F. J. Ward, of Knowle) seconded the vote, which was cordially passed.

Promotion.

The President (before the party separated) said he would like to take the opportunity of congratulating, in the name of the Association, Mr. G. F. Twigg, of Derby, on his success in obtaining the position of Assistant at the Jersey Gas-Works.

Mr. Twigg, in response, acknowledged the benefit he had derived from membership of the Association.

SOME GERMAN IDEAS ON DOMESTIC GAS HEATING.

The following is a translation of an article on this subject by Direktor O. Peischer, of Innsbruck, Germany, which appeared in the "Journal für Gasbeleuchtung" of Dec. 6. In view of the attention paid of late to gas-fires in general, and more particularly to questions of radiant and convected heat and the ventilating effect of gas-fires, some of the ideas advanced by the author may be of interest. Gas-fires are neither so popular nor so successful in Germany as in England, and the reflector convected-heat type is that almost exclusively used. Let these remarks of Direktor Peischer speak for themselves.

Interest in the heating of rooms by gas is increasing in a most satisfactory manner, and articles on the subject are appearing frequently in the Technical Press. In technical circles also the feeling is general that the efficiency of modern stove constructions is not satisfactory, and that they will have to be considerably improved before an unlimited and general introduction of domestic gas heating can be possible. In recent times discussion has been keen as to which serves its purpose better—the fire which supplies mainly radiant heat, such as the English and French forms, or the convected-heat type with strong air circulation, such as the German reflector stoves. I maintain that this should be decided first of all by the strength of the pull of the chimney flue, and also by the nature and disposition of the room in question. But these systems have a common fault; the combustion of the gas takes place in the presence of a great excess of air; and owing to the free access of air to the flue-vent, a large amount of air, which has already been warmed in the room, is continually passing away up the chimney. This must have a very harmful effect on the room-heating efficiency. Professor Bunte, in his paper on Surface Combustion, at Strassburg, showed diagrammatically how much the combustion temperature is reduced by excess of air, and how harmful this is to the heating efficiency.

In the attempt to increase the heating efficiency of gas-fires, it must above all be aimed at reducing to a minimum the excess of air, and the loss through the flue-vent of heated air from the room. I have attempted to accomplish this with a closed-in stove with adjustable combustion air supply, and I achieved so much better heat-efficiency results with this type in comparison with those of a reflector fire of the best type, that a prosecution of this idea seems well worth consideration. I would here state that in my experiments I laid more stress on the comparison of my stove with those of other types than on the absolute efficiency; for the high efficiency results obtained from an analysis of the waste gases of the reflector fire agree very badly with actual observations, and seem to indicate that theoretical efficiency and actual heating effect measured in the room are very different.

For my comparative tests I took as my unit the product of area of room × time of heating × increase of temperature (based on initial temperature), which, divided by the volume of gas consumed, gives a unit of heating efficiency per unit volume of gas. Necessary conditions for the test are: Room facing North; same hourly consumption for both fires; connection to same chimney; equal initial inside temperature. And, of course, outside temperatures must be more or less equal. This method of comparison is simple, and gives a correct idea of the general effect.

The author then mentions the results of some of his experiments, in the course of which he states that his closed stove draws twice as much, and ordinary reflector stoves six times as much, air out of the room as is theoretically required for combustion—thus, he says, cooling the stove and lowering the flame temperature. The author concludes by again stating, with great emphasis: But it seems to me that it is most necessary of all to reduce to the lowest possible the usual enormous excess of combustion air and the undue drawing-off through the chimney of warm air from the room.

Concrete-Encased Steel Water-Pipes at Swansea.—The action of the Swansea Corporation, on the advice of the Borough Engineer (Mr. G. Bell) in laying steel pipes encased in reinforced concrete to carry water through areas affected by corrosive acids, has excited considerable interest in municipalities having to provide new or increased water supplies. This kind of main was suggested by the experience of Paris and Brussels, where the bursting of pipes due to high pressure has practically ceased by the use of the protective reinforced concrete. Last Friday the Engineers of Birmingham and Leeds paid a visit to Swansea for the purpose of examining the pipes.

SCOTTISH JUNIOR GAS ASSOCIATION.

EASTERN DISTRICT.

Visit to Messrs. R. & A. Main's Works at Falkirk.

An interesting and educative insight into the manufacture of gas-heating apparatus was afforded to about forty members of the Eastern District Division of the Scottish Junior Gas Association on the occasion of their visit to the Gothic Iron-Works of Messrs. R. & A. Main, at Falkirk, on Saturday afternoon. The visitors included Mr. William Geddes, of Granton, the President, Mr. A. Bishop, the ex-President, and Mr. Lawrence Farquhar, the Hon. Secretary; and the partners of the firm—Mr. R. Main and Mr. A. Main—were present. The visitors were hospitably received at the office early in the afternoon, and, separating into parties of eight, were conducted through the works by Messrs. A. Dunbar (Works Manager), T. M'Ewan, W. Carmichael, Russell Murray, D. M'Kinnon, Robert M'Nab, H. M'Pherson, and John Andrew.

In the pattern shop, the company witnessed the initial stage of gas-stove construction; the models being built up of white metal or wood. It was pointed out that from these are cast the "original" or "master" patterns in iron, and from the latter again the working or plate patterns, also in iron—the last named being a modified type of pattern embodying more than one article on each plate, and used for repetition work and making in large quantities. In conjunction with the pattern shop was seen the pattern store, where all patterns are carefully kept. The visitors were somewhat surprised to learn that these number many thousands, and are essentially of great value to an ironfounding business. The moulding shop was next visited; and in the nature of the work done there the members of the Association manifested great interest. It was stated that the shop is heated in case of severe frost by special coke-stoves, of the firm's own design, and is well lighted throughout by Bland inverted burners. This kind of lighting is used with great success throughout the works and offices.

During the inspection of the core shop, the genial guides gave some interesting details in regard to the work done there. The shop is worked in conjunction with the moulding shop for supplying all the sand cores for hollow castings, such as burners, gas-radiator tubes, &c. The cores are moulded with a specially prepared mixture of sand, and baked in a large coke-heated drying-oven. From here they are wheeled on bogies to the spot where this particular class of work is made. The castings, on leaving the moulding shop, are brought to the dressing shop for the purpose of being trimmed and dressed up; all rough edges being removed by the emery wheel. The small castings are cleaned in a "rumbler"—a species of iron barrel, filled with the castings to be treated, which revolves continuously for a certain period, the castings thus cleaning themselves by inter-friction. From the dressing shop all the castings are handed over to the passer and his assistants, who carefully examine every article for flaws and defects, passing on only castings of good quality. The castings are then removed to the castings warehouse for use.

Much that was of interest was observed in the boring shop, where all castings required to be drilled or bored are handled. A large portion of the space is devoted to burners, the jets of which have all to be separately drilled to ensure burning with an accurate flame. In the enamelling department, the visitors witnessed, among other things, an elaborate central gas-range, which is to be despatched shortly to a millionaire in Valparaiso. It was stated to the "JOURNAL" representative that this stove, which is the only one of its kind ever built in Scotland, is 6 ft. by 4 ft., and 5 ft. 6 in. to the top of the copper canopy. The range is constructed on the same principle as the well-known "Main" cookers, and contains a double-backed pastry-oven, made up on the regenerative principle. It is beautifully nickel-plated and elaborately designed.

THE FIRM'S HOSPITALITY.

After the inspection, the company assembled in the offices, where an enjoyable repast was served. After tea, the CHAIRMAN (Mr. R. Main) briefly addressed his guests.

In proposing the toast of "The Association," he remarked that by the time some of those who were present had reached middle age they would have witnessed an enormous expansion in the gas industry. As they all knew, great improvements had already been made in the manufacture of gas; they were being made to-day, and would continue to be made. He envied the young men present in having chosen a profession with such a future before it; for who knew but that some of those seated round the tables might be the great gas engineers of the future who would supply that much-desired quantity—"gas at 1s. per 1000 cubic feet." It was now thirty-six years since the firm of R. & A. Main started making gas-stoves in a little place not quite so big as the room in which they were sitting. At that time they managed to sell about one stove per month with great difficulty [laughter], because the prejudice was strong, and the people honestly contended that the Government should not allow such detestable things as gas-stoves to be sold to the innocent people of these islands. They were quite certain that there was "poison in the cup." [More laughter.] But nowadays people regarded the industry in a different light; they regarded it as a boon to the whole community, as a means of lessening the drudgery of women's work, and of diffusing happiness and goodwill in the homes where gas was introduced.

Mr. GEDDES having replied to the toast, the visitors were addressed by Mr. KENNETH AIRD, the Managing-Director of the Gothic Works, and Mr. HENRY O'CONNOR.

THE FUTURE OF OIL FUEL.

This was the subject of the Inaugural Address delivered by Sir BOVERTON REDWOOD, as President of the Junior Institution of Engineers, at their meeting on the 5th inst.

Practically at the outset, the author acknowledged that the forecasting of the future of oil fuel in general was a complicated problem. To a large extent the immediate future depended on the evolution of the internal combustion engine, and, as regards the mercantile marine, upon the measure of success attending the efforts to construct satisfactory engines of the Diesel type of large cylinder capacity. In this connection, he said it must be remembered that the advent of the steam-turbine and the economies resulting from the use of superheated steam, together with other recent improvements in the efficiency of the steam-engine, had rendered the task of the advocates of the internal-combustion engine more difficult. Moreover, the replacement of the turbine steam-engine by the oil-engine involved a return to the reciprocating type of machinery, which was in itself a ground of objection, as being in a sense a retrograde step, for at present there seemed no prospect of the evolution of a successful turbine oil-engine. The substitution of oil fuel for coal in steam-raising was, however, a wasteful method of using this source of power, for whereas with the steam-engine not more than 12 per cent. of the energy of the fuel was ordinarily obtained in the form of work, in the case of the Diesel engine the return was often as much as 37 per cent.

Having given statistics of the world's production of petroleum, Sir Boverton turned to its consumption, and remarked that the overtaking of the former by the latter was most marked in the case of motor spirit. He pointed out that in Great Britain alone the consumption of this product, which in 1905 was only about 18 million gallons, has increased to not far short of 100 million gallons; the imports last year amounting to about 80 million gallons. Of these imports, 46 million gallons came from the Dutch East Indies, and 16 million gallons from the United States. Taking the average proportion of motor spirit obtainable from the crude oil at 10 per cent., the amount imported last year represents only about 2½ per cent. of the world's output of this product; but it is a significant fact that whereas a few years ago the United States supplied the world, we only obtained from that country last year one-fifth of the quantity we required, and, with the rapid growth in the American home consumption, the export trade may soon reach the vanishing-point. The present situation is mainly due to the circumstance that the use of motor spirit in road vehicles has increased with startling rapidity—at a rate, indeed, which is presumably far greater than was foreseen by any of those responsible for the supplies of the fuel.

Turning to the means of increasing the production of motor spirit, the President said: Bituminous shale, such as is distilled in Scotland, occurs in many parts of the world; and from this source a large quantity of motor spirit might be obtained, especially if the heavier portions of the distillate were "cracked." But the Scottish refineries only produced about 0·75 per cent. of the quantity of motor spirit consumed in this country last year; and of this a considerable part is sold for solvent purposes. The coal-tar product benzol is now being very successfully substituted for the petroleum product; and if benzol could be obtained in sufficient quantity, the apprehension of a famine in petrol might be dismissed from consideration. But it must be borne in mind that the greater part of the benzol produced in this country is exported. No doubt if recovery plant were generally provided in connection with coke-ovens, the quantity of benzol available could be very largely increased. But this change, which is already in progress, can only come about gradually; and meanwhile the demand for a suitable spirit is daily increasing. If, further, the general adoption of a low-temperature system of carbonizing coal could be brought about, a much larger proportion of suitable liquid products could be obtained. But no process could be advocated for general adoption with any prospect of success which did not furnish a coke of good quality, though certain inferior descriptions of coal, at present unusable as fuel, might be profitably converted into liquid products.

In these circumstances, and especially having regard to the obvious fact that our stocks of oil, oil shale, and coal are in process of depletion, the Imperial Motor Transport Council recently appointed a Committee to investigate the subject of the manufacture and use of alcohol as a fuel for internal-combustion engines. By the adoption of suitable processes of fermentation and distillation, alcohol can be manufactured in unlimited quantities from vegetable products at a cost which would probably admit of its profitable sale at 1s. a gallon; and there is thus the opportunity for the creation of a new industry which would be of incalculable benefit to our over-seas dominions. The first step, however, is to furnish adequate evidence that alcohol is an available and effective substitute for petrol; for it would be unreasonable to expect the Government to give the necessary facilities for the use of alcohol as fuel until this has been done. Meanwhile, it should be pointed out that trials carried out in the United States have shown that alcohol can be satisfactorily used in an internal-combustion engine, and that, in spite of its lower calorific value, alcohol has, in practice, nearly as high an efficiency as petrol, owing to the different character of the combustion, and the higher compression which can be employed without risk of pre-ignition;

while in admixture with one-third of its volume of benzol it has yielded better results than petrol gives.

The various descriptions of oil fuel obtained from crude petroleum do not differ greatly in calorific value. For the use of such oil in steam-raising, various systems have been from time to time patented. One of the simplest devices is the burner of Nobel, which consists of a number of shallow troughs, arranged in superimposed series at the front of the furnace, so that the burning oil flows by successive stages from the highest to the lowest, the flame of the burning fuel being swept into the furnace by induced draught passing between the troughs. With this apparatus it was found that 1 lb. of Russian astatki (petroleum residuum) evaporated 14½ lbs. of water; whereas with the same boiler 1 lb. of coal evaporated only 7 lbs. Among other systems proposed was that of causing the oil fuel, accompanied by heated air, to percolate upwards through a porous bed placed in the bottom of the furnace space. Other inventors preferred to effect the vaporization of the oil in a small retort lying in, and heated by, the boiler furnace, or in a separate (or external) boiler or retort. By far the greater number of the earlier patents were, however, for the atomization of the oil by steam, though the use of compressed air was specified in some instances. The later practice has been to effect the atomization by forcing the oil at high pressure through a jet of suitable construction; and this type of burner is now invariably used in marine work, as the use of steam for the purpose makes an undesirable demand upon the boiler. Reference should also be made to the Bonecourt system of surface combustion, invented by Professor Bone and Mr. M'Court, which may prove a most economical system of using oil fuel.

The substitution of oil fuel for coal in steam-raising is, however, a wasteful method of using this source of power, for whereas we do not ordinarily obtain with the steam-engine more than 12 per cent. of the energy of the fuel in the form of work, in the case of the Diesel engine the return is as much as 37 per cent. Unfortunately, the difficulties attaching to the construction of engines of this type with large cylinders, are great; but so much attention is now being given to the subject by engineers of the highest eminence, that it may be confidently anticipated that the obstacles will be overcome. Meanwhile, the use of the Diesel engine of moderately high power on land is making steady progress, and much has already been accomplished in its application to marine work. On the Continent, a good deal of attention is being devoted to the application of oil-engines of the Diesel type to locomotives.

In drawing his address to a close, Sir Boverton said: It is evident that the future of oil fuel depends not only on the extent to which it is reasonable to assume that the output can be increased, but largely upon the manner in which the fuel is used; for in the light of our present knowledge it would obviously be wrong to suggest that the supply can ever become so abundant as to give consumers in general a free choice in substituting oil for coal as a source of power for industrial purposes, especially if the oil is not used in the most economical manner. The petroleum industry is one of great magnitude and importance. It never has been in a more vigorous condition than it is in to-day; it is unquestionably capable of much further expansion; and the use of oil fuel will undoubtedly largely increase. But although it is impossible to say what further stores of petroleum remain to be discovered, it is evident that, notwithstanding the rapid development of the remarkably prolific fields of California and Mexico, the success which is attending the drilling operations in Persia and Sarawak, and the promise of a large yield in Trinidad, it will require a very considerable expenditure of capital to increase greatly the average rate of expansion of the petroleum industry, having regard to the circumstance that some of the older oil-fields are showing signs of exhaustion. What may be the position even in the immediate future it is impossible to predict with any approach to precision, owing to the uncertainty of the factors.

In conclusion, the President pleaded for economy in the production of petroleum no less than in its use, and reminded his audience that without a highly efficient staff, the fullest economy was not possible. Millions of pounds sterling had, he said, been thrown away in haphazard drilling operations, and valuable oil-fields had been destroyed by reckless procedure. The importance of obtaining the advice of competent field geologists with special experience in petroleum before spending money in sinking wells, and of being similarly guided in the work of systematic development, was now very generally, though not invariably, recognized. There was at least as much need for efficiency in the various operations incidental to the conversion of the raw material into the various commercial products; and there the chemist should be associated with the engineer. In order that the business might be profitably conducted, there must be skilful management of the storage, transport, and marketing of the produce of the wells.

Mr. J. S. Pickering, M.Inst.C.E., the Borough Surveyor and Water Engineer of Cheltenham, and the immediate Past-President of the Institution of Water Engineers, has been nominated for the presidency of the Institution of Municipal and County Engineers.

Scottish Junior Gas Association.—A meeting of the Western District Division of the Scottish Junior Gas Association was held in Glasgow on Saturday, at which Mr. Alex. Paterson submitted a paper on "Complaints and their Treatment. and Some Notes on Underground Work." The paper reached the "JOURNAL" office too late to be dealt with in to-day's issue.

CALCULATED AND DETERMINED CALORIFIC VALUES OF GAS.

At the Meeting of the Newcastle Section of the Society of Chemical Industry last Wednesday, Mr. G. WEYMAN, M.Sc., read a paper on "The Difference between the Calculated and Determined Calorific Values of Coal Gas."

The author showed that, when coal gas is passed through tar, the determined calorific value is increased or reduced according to whether the temperature of the tar is higher or lower than that at which it had been previously removed from the gas. The calculated value was, however, practically the same, though some curious discrepancies in the analysis appeared. This pointed to the presence of hydrocarbon vapours not estimated in the analysis. Adopting Bunsen's method of estimating these hydrocarbon vapours by absorption with alcohol, followed by treatment with water to remove alcoholic vapours, the author found varying quantities of absorbable vapours present in the gas, which accounted for the discrepancies in the analysis just mentioned and the difference between the calculated and determined values. Analyses were produced comparing the results of the method involving the removal of vapours and the usual method in which they are not taken into account. Serious discrepancies were apparent; showing that in an analysis as usually made the hydrocarbon vapours contribute to the amount of the gases absorbed by the various reagents, and yet leave sufficient to affect materially the determination of the methane and hydrogen. The author concluded by laying stress on the fact that the hydrocarbon vapours are physically quite distinct substances from the olefines usually estimated by absorption in bromine.

A discussion followed the reading of the paper.

Dr. P. PHILLIPS BEDSON congratulated the author on his paper. Personally, he rather objected to the use of alcohol as an absorbent, on account of its volatility, and said he had no doubt that a more suitable reagent might be found. The problem was, of course, difficult on account of the possible solubilities of the other gases. He thought the composition of the olefines provided field for further work.

Mr. E. F. HOOPER, the President of the North of England Gas Managers' Association, congratulated the Newcastle and Gateshead Gas Company on the enterprise they had shown in providing opportunities for having such experiments made as those dealt with in the paper, and the author for having carried them out. He thought that comparison of the products from horizontal and vertical retorts treated in this way would throw valuable light on the problems connected with the introduction of the new plants. He noticed what great differences there were in the tars from the two systems.

Mr. S. H. COLLINS alluded to the proportion of benzene in hydrocarbon vapours.

The CHAIRMAN (Mr. T. W. Lovibond) remarked that there evidently appeared to be a very wide scope for future work on the subject discussed; and he hoped the Society would have further papers from the author.

Mr. WEYMAN, in reply, agreed with Dr. Bedson that it would be an advantage to have a less volatile absorbent. He said the hydrocarbon vapours consisted chiefly of benzene; but homologues were also present. He concluded by thanking Mr. Hooper for his suggestions for future work.

EXPERIMENTS IN SPRING-FINDING.

Under the heading of "The Scientific Week" the "Chemical News" Paris correspondent recently gave the following particulars of some new experiments which have been carried out in connection with the location of springs.

In spite of all the researches that have been made about the mysterious power of spring-finders, the problem of source-finding remains obscure. Fifteen years ago, in the Laboratory of Marey, Dr. Marage undertook some experiments of which the object was to determine what was true in the phenomenon of the spring-finder's wand. These experiments, of a psycho-physiological order, are excessively long; and all those who have studied these questions know the difficulties that are met with before being able to make any serious observations. Having established that this phenomenon seems to be found in a great number of subjects—about one out of ten—Dr. Marage resolved to have recourse preferably to amateurs, absolutely disinterested as to the positive or negative success of the search for springs, and having scientific culture. He entered into relation with some engineers, and it is the exceedingly interesting results of these experiments that Professor d'Arsonval presented to the Paris Academy of Sciences.

The experiments were made in Tunis, on the side of road No. 38, from Enfidaville to Kairourou, and No. 3, from Enfidaville to Zaghouan. They were made by M. Laudesque, the Road Surveyor, and controlled by civil engineers. As the wand gave him no result, M. Laudesque made use of the pendulum form, as is well known, by a little sphere or a small conical cylinder suspended at the end of a thread. He was able to determine nine springs of water, and to indicate beforehand a depth of the water

varying from 5 to 19 metres (about 16 to 62 feet). Soundings were made at the nine points. Water was always found, and the depth was recognized as exact at seven points. But there were two errors—the first at the 21st kilometre of road No. 38, where water was announced at 13 metres and found at 23 metres; and the second at the 19th kilometre of road No. 3, where water was announced at 18 metres and found at 3 metres. The error of depth seems to be due, in the first case, to an incomplete examination of the ground, and in the second to the width of the subterranean current.

In these kinds of researches—the negative experiments being often more instructive than the positive—M. Laudesque tried to discover the explanation of the errors he had committed. Dr. Marage thinks that the experiments have the advantage of not giving rise to any criticism on the part of professional spring-finders, who, indeed, contest the value of the results obtained on water channels. Moreover, thanks to the Service of Roads and Bridges, which possesses the means of taking soundings, these researches may be continued in our African colonies. M. Laudesque is quite disposed to give his services to the Commission appointed by the Academy of Sciences, composed of MM. Armand Gautier, Dastre, Violle, and Douville, in order to make, under its direction, whatever experiments may be considered useful. In any case, the experiments of M. Laudesque are, according to Dr. Marage, the first really well-conducted experiments made on spring-finders, as well as the first to have given practical and indisputable results.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Modern Gas-Stove Construction.

SIR,—I thank you for the opportunity you have given me of supplementing my paper on "Notes on Some Points in Modern Gas-Stove Construction" published in your issue of the 2nd inst.

In commenting on the difference of the quantity of gas necessary to raise and maintain the given temperature, you evidently take "G" in the figures given into consideration. This should not be so, because, as I was careful to point out, this was a stove with cast-iron lining, which is now rapidly becoming obsolete, and was only given to show the difference between cast and sheet linings. The figures for open crowns should be 14·76 – 11·00 = 3·76; and for the packed crowns, with reduced flue outlet, 11·14 – 9·92 = 1·22. I think this shows that, by making the alteration I suggest, the cookers now on the market can be made almost equally economical.

Where you speak of the saving in consumption in favour of the packed crown, I want to again point out that this cannot be obtained by packing the crown only, and reducing the flue outlet. If you do this, in the majority of cookers you will find that smothering immediately takes place. In fact, by simply packing the crown and leaving the flue outlet at its former size, you will find that the flames are drawn out and beaten down badly—even if complete smothering of some of the jets on one side or the other does not take place.

Your suggestion of a lever tap with a half-circle scale is a good one; but I doubt whether it would answer in practice. In my early experiments, in order to try and regulate the oven tap more correctly, I soldered about 3 inches of ⅛-inch wire on to the tap. Even then I found that a movement of about one-sixteenth of an inch at the end of this was more than was required for the variation wanted. The better plan was to hold the tap firmly with one hand and just lightly tap it in the direction required with anything handy—generally a rule.

Anyone who has made a number of experiments on ovens will, I think, bear me out when I say that to keep an oven at a level temperature is a very delicate matter; the slightest movement of the tap being immediately followed by a large difference in oven temperature. In my case, I had the advantage of a test holder; so that there was no slight variation in pressure to affect the result.

The setting of the adjustment before leaving the works would have to be very nicely regulated to gain the required result, and the question of different qualities of gas and varying pressures for different districts taken into consideration.

If anything of this sort is attempted, I would suggest that it would be accomplished by the thermostat now coming so much into favour in hot-water work. There again, however, there are a number of difficulties to be overcome; and I fancy even if it were accomplished, the cook, after looking at the joint, would turn the gas down to what appeared to her to be the correct size jet, without paying any attention to the position of the indicator.

Now as to the question of water-heating from the oven. The idea impressed the General Manager of this Company as being at any rate worth a trial, and cookers were ordered with this attachment and placed on hire. Although it is not generally known, in the last ten months we have sent out over 300—mostly in the West-end of London; and, as far as we know at present, they are giving satisfaction.

Naturally, this was not done without exhaustive test by those responsible to the General Manager for this class of apparatus, who reported to him that the primary object of the cooker had not been interfered with.

As I said in my reply, I do not think that the laboratory test is applicable in such a case as this; for, although I claim that a large amount of the heat I utilize is from that deflected by the crown, yet at the same time there is a certain drop in the oven temperature, due to the presence of the coil. The question then comes in, "How much heat is it possible to abstract from the oven without the cook being aware of the fact." I am fully convinced that as much as 15° or 20° can be thus abstracted without the ordinary cook knowing that it is being done; and her joint would be just as well cooked.

The question of deflected heat is one that has to be taken into consideration in this case; and that is why I say that the laboratory test is not the test required for an apparatus of this description.

If browning is required, the cook places her pastry under a browning shelf, or at the top of the cooker. Why? Because the heat deflected from the crown is so intense that it is enough to scorch or brown the pastry to the desired degree. That is why I place the coil at the top of the cooker; and I find that as soon as I begin to drop the position of the coil in the oven, I lose the heat I otherwise should have obtained in the water.

If we regard the cooker as a sealed vessel, heated externally, then any heat abstracted must be made up. You cannot get something out of nothing.

The cooker oven is, however, in a way a large flue in which a current of hot gas is continually passing. It therefore stands to reason that at the top of the oven—after the hot gas has passed the article being cooked—a certain amount of heat may be abstracted, without seriously affecting the temperature at the cooking-point.

In treating my results from the point of thermal efficiency of the apparatus, you are surprised at the results obtained. So was I. Still I am convinced that we shall ultimately get far more out of the cooker than we do at present; for the more one inquires into the why and wherefore of things, the more one finds how much there is yet to learn.

Mr. Potterton about a twelvemonth ago carried out water-heating experiments with his "Sealed" gas-cooker; and if you refer to his results—which were then published in the "JOURNAL"—you will find that they were even better than mine.

The reason I quoted 6 gallons of water by kettles was merely to make the comparison evident.

For the proper cleansing of greasy plates and dishes, boiling water is not necessary. It should, however, be at least 150° Fahr. to be satisfactory; 140° would do all right, but would not be considered hot enough by some people.

There is as much in the management of washing-up water as in any other detail of domestic economy, if looked at from the proper light. With one person, boiling water is required; while another will wash up in a little drop of cool dirty water, which cannot properly cleanse any article. A little soap or soda and good management can get over a lot. You say: "Hot water is not always wanted every time the oven is in use." I must beg to differ from you there. At any rate, I think the occasions you refer to would be very few and far between.

The coils have not yet been tried on other than London water; but with circulation continually going on, and the water not often exceeding a temperature of 180° Fahr., I doubt whether the choking-up referred to would take place to any great extent.

"Do the coils decrease the oven capacity?" There is only one. In the smaller size stoves ½ inch or in large sizes ¾ inch, with a rise of 1½ inches altogether; and as this runs round the top of the oven, the capacity is not decreased. A browning shelf, if used, is generally not less than 1½ inches from the crown; so I think it may be safely said that the capacity is not interfered with.

Just towards the end of my reply, you report me as saying: "His idea was that in the laboratory there was not so much of a saving to be shown by the use of his apparatus; but in the house nobody would notice the few feet of gas it used." If I said this, it was not what I intended. What I meant to say was: "Nobody would notice the few degrees drop in oven temperature due to its use."

Perhaps you or your correspondent can give us advice on one point, and that is a cheap preparation for preventing the water becoming rusty. From the makers' quotations, it seems that Bower-Barffing or galvanizing the tank is prohibitive, on account of price. The most successful method tried at present is three coats of air-drying Bath enamel; and even this is inclined to smell for the first few times of the tank being used. If you know of anything that would be satisfactory, I should be glad to give it a trial.

I do not wish either you or your readers to think that I claim to have made any original discovery in either of the recommendations I have made. My "points" are all in actual use in one cooker or another. What I have tried to do is to find out what effect these different constructions have on the safety and economy of the oven, and, from the results obtained, make suggestions to which the makers might give consideration in designing new cookers.

F. S. LARKIN.

Gaslight and Coke Company, Fulham, S.W., Dec. 9, 1913.

Gas and Electrical Maintenance Costs.

SIR,—I appreciate the remarks in your editorial columns on my paper.

I should like to say, however, it was not my intention to suggest that there was, or could be, any comparison with regard to costs between first-class work on the electrical side and medium gas installations. I simply gave these to convey some idea of what in an electrical engineer's opinion it was possible to pay for, as I state, first-class work. For a comparison with the gas installation I quote a figure for the electrical installation of 10s. to 15s. per point.

I am quite in harmony with your statement that the objective is to give as little trouble to the consumer with regard to maintenance matters as possible; and you will notice I suggest for a present temporary expedient that undertakings might initiate a system of maintenance, though this would mean considerable expense if carried out free. Still it appears very desirable.

JAS. WM. THORNLEY.

Salford, Dec. 14, 1913.

Gas Water-Heaters.

SIR,—Referring to my letter, concerning the cost of water-heating, which you were good enough to insert in your issue of Nov. 11, I expected to have seen some comments by the advocates of gas for this purpose, which would have been of interest.

The subject is an interesting one; and the passing of the kitchen range makes the hot-water question an important one in every household.

P. B.

Dec. 3, 1913.

LEGAL INTELLIGENCE.

ALLEGED ENCROACHMENT ON A GAS COMPANY'S AREA.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Tuesday, Dec. 9.

(*Before Mr. Justice* EVE.)

Whittington Gaslight and Coke Company, Limited, v. Chesterfield Gas and Water Board.

In this case the plaintiffs sought an injunction to restrain the defendants from laying, completing, or connecting a gas supply in Foundry Street, Whittington Moor, in the county of Derby, or elsewhere in the parishes of Brimmington and Whittington, so or in such manner as to constitute the extension of an existing gas-main of the defendants, in contravention of the provisions of the Chesterfield Gas and Water Board Acts, 1905 and 1911, and from utilizing any main laid in contravention of the Acts for the supply of gas. The plaintiff Company, which was formed in 1864, had supplied with gas the two parishes named; and the defendants were incorporated in 1895 for the purpose of acquiring the undertaking of the Chesterfield Water and Gas Company, which was incorporated in 1825. The Act provided that it should not be lawful for the defendants to extend their mains into the parishes of Brimmington and Whittington unless with the previous consent in writing of the plaintiffs. In the month of November last year, defendants, in contravention of the Act of 1895, and without the previous consent of plaintiffs, extended their existing main in Sheffield Road by laying a 2-inch gas-main running from, and connecting with, the main in Sheffield Road, under and along a street known as Foundry Street. The extended main was some 88 yards in length, and, with the exception of a small part, was situate in the parish of Whittington. The defendants said that in the month named they, on the application of Mr. Green, the occupier of a foundry in Foundry Street, agreed to supply him with gas for power and lighting in his foundry. To enable them to give him this supply, they laid a service-pipe about 88 yards in length, and he paid a part of the cost. They further said that the pipe was laid in the lawful exercise and performance of the powers conferred by their Acts, and was provided for the supply of gas to one customer only; and that it was not of greater capacity than was required for the purpose of such supply. They also denied that they had wrongfully, or in contravention of the provisions of the Act of 1895, extended the main in Sheffield Road, and said the plaintiffs' consent was not required for the laying of the service-pipe.

Sir A. CRIPPS, K.C., and Mr. F. H. MAUGHAM appeared for plaintiffs; Mr. R. YOUNGER, K.C., and Mr. W. J. SCHOLEFIELD represented the defendants.

THE PLAINTIFFS' CASE.

Sir A. CRIPPS, in opening the case, said the point for decision was really what was a "main." Here the pipe which had been laid ran along the street, and was in a position from which private consumers could be supplied, and it had sufficient capacity to supply all the cottage property lying between the foundry and the main. There was no definition of the word "main" in the Gas-Works Clauses Act, 1847; but in the Electric Lighting Clauses Act, 1899, it was defined as meaning any electric line which might be laid down by the undertakers in any street or place, and from which anyone might be supplied. His contention was that this pipe was a "main" from which consumers might be served for the purpose of a "general supply," which meant a supply to ordinary consumers.

The following evidence was then given for the plaintiffs.

Mr. *H. E. Jones*, M.Inst.C.E., said he had made himself acquainted with the character of the pipe in question, and in his opinion it was capable of supplying customers between the foundry and the main. It was of wrought iron, and 2 inches in diameter.

Cross-examined: The capacity of a pipe was a matter entirely in the discretion of the manager of the gas-works; but one factor would be the distance to which it had to go from a main to the consumer's premises. At the end of the pipe, with a pressure of 2-10ths of an inch, the estimated delivery of gas would be 450 cubic feet per hour. He understood Green's actual consumption was 400 cubic feet. By increasing the pressure at the works, more gas could be delivered; but the pressure would be increased all along the three miles from the works to Green's premises.

Mr. *H. H. Everest*, the Manager of the plaintiff Company, said they had from seven to ten miles of main in the parish of Whittington, but not many 2-inch pipes. In Foundry Street there was a 3-inch main supplying forty-nine houses.

Cross-examined: These houses might be described as cottage property; and the average consumption of each would be about 8000 cubic feet per annum.

Mr. *Joseph Cash*, M.Inst.C.E., the Consulting Engineer to the plaintiff Company, said he thought the 2-inch wrought-iron pipe would, under the conditions of pressure mentioned, be capable of supplying all the houses between the main road and Green's foundry.

Cross-examined: With a pressure of 20 10ths, the delivering capacity of the pipe would be 3000 cubic feet per hour, and 4000 cubic feet per hour with a pressure of 30-10ths.

After consultation between the expert witnesses engaged in the case—those named above and Mr. E. K. Burstal, M.Inst.C.E., and Mr. R. G. Shadbolt, of Grantham, who were advising the Chesterfield Board—it was stated that the following figures had been agreed upon: A 2-inch pipe 130 yards long, with 25-10ths pressure, would deliver 1730 cubic feet per hour; with 20-10ths pressure, 1549 cubic feet; and with 30-10ths pressure, 1990 cubic feet—the delivery in each case being to the open air.

This was the case for plaintiffs.

THE DEFENDANTS' CASE.

The following evidence was given on behalf of the defendants.

Charles Boldery, Outdoor Manager of the defendants, stated that, after inspecting Green's premises and the gas-engine, he came to the conclusion that a 2-inch pipe was needed, having regard to the quantity of gas to be supplied through the pipe and the distance to be traversed. As gas would be wanted for lighting and for power at the same time, he thought that 526 cubic feet per hour would be required; but the maximum amount supplied was about 400 cubic feet. The pipe was not large enough to supply the houses between the main and Green's premises.

Wednesday, Dec. 10.

Mr. YOUNGER submitted that it had not been proved that the defendants had done anything which they were not entitled to do under the provisions of their Acts. They had not extended any main, but merely laid a service-pipe from an existing main. There had never been any attempt to evade the conditions of the proviso of the protective clause of the Act of 1895, that the mains should not be extended unless with the consent of plaintiffs; nor was there the slightest intention on the part of the defendants or of Mr. Green to use the pipe other than as a service-pipe. He wondered why plaintiffs had been so anxious to fight what was a really trivial case.

Sir A. CRIPPS, in reply, contended that the pipe to Green's foundry was really an extension of the 15-inch main in the Sheffield Road.

Judgment.

His LORDSHIP, in giving judgment, said the dispute raised two questions; but in the event of the former being determined according to the contention put forward by the plaintiffs, the latter did not arise. The question of law involved the true construction of a restrictive proviso imposed on the exercise by the defendants of their statutory power to supply gas in two parishes. The proviso was embodied in the concluding words of section 4 of the Chesterfield Gas and Water Board Act, 1895: "Provided that it shall not be lawful for the Board to extend the existing mains unless with the previous consent in writing of the Whittington Gas Company, Limited." A proviso in nearly similar terms was to be found in section 5 of the Act of 1865, which was an Act whereby the defendants' predecessors in title were first authorized to extend their limits of supply so as to include the two parishes in question. One would expect, having regard to the expressions "to extend their main" in the earlier Act, and "to extend the existing mains of the Company" in the later Act, that there were existing both in 1865 and 1895 mains belonging to the defendants and their predecessors for the supply of gas in both parishes. From these mains consumers had for nearly fifty years been supplied with gas by means of service-pipes connected with the mains without the consent of the plaintiff Company; and the number of consumers had varied from 61 in 1879 to 81 in 1894 and to a minimum of 6 in 1895. At the present time, the number was 43. In view of these facts, it was difficult to understand why the plaintiffs had not intervened before. They said that the word "main" in the proviso was equivalent to "pipe," and that the true effect of the restriction was to prevent any further supply of gas in the two parishes without their consent. As an alternative it was suggested that, if the effect of the restriction was not so wide as was just stated, it at least operated to prevent any supply which was not either given in 1895 or was not of a nature, for all practical purposes, similar to those given in 1895. He could not accede to either of these contentions. In 1865, and certainly in 1895, the undertaking to which the defendants were then succeeding included two items of property quite distinct in character—one the mains by which, according to Lord Selborne in *Milnes v. Mayor of Huddersfield*, the commodity (in this case gas) was brought into the street from the source of supply—viz., a main; and the other, service-pipes, by which the commodity was being conveyed from these mains to the individual gas consumers. In his Lordship's opinion, it was impossible to read the word "mains" in the proviso as covering both these items of property. The word "extend" was appropriate to "mains," not to "service-pipes;" and if the Legislature had intended to prohibit the defendants from making further service connections, or from making service connections of a different character from those then existing, there would have been added to the word "extend" some such expression as "to increase the number of," or words indicative of the Legislature's intention to preserve, as far as possible, the *status quo* with regard to the number of gas consumers. Moreover, the distinction between "mains" and "pipes" had been clearly recognized many years before 1895, in the General Act of 1871 and in the Special Act of 1876 of the defendants' predecessors. He thought the proviso meant what it said, and that it was limited in its operation to "mains," properly so-called, as distinct from "service-pipes." This construction rendered it necessary to consider the question of fact. Was or was not the pipe by which the supply of gas was carried to Green's foundry a "main"? Sir Alfred Cripps had addressed the Court on a point which was not raised by the pleadings. Exception was taken, on behalf of the plaintiffs, to the source from which the gas delivered to Green's foundry was drawn—a 15-inch main on the west side of the Sheffield Road, and not in either of the two parishes. For the purpose of the action, it was absolutely immaterial whether this main was laid yesterday or twenty years ago. The point was whether or not the 88 yards of pipe between the 15-inch main and its entry into the foundry was a main. For the plaintiffs it was said that it presented some of the characteristics of a main—indeed, that it possessed all the attributes of a main, having regard to the position in which it was laid, not at right angles in the direction of the road, but parallel with that direction. There was nothing really in that. The premises to which gas was conveyed had to be approached by the most economical and convenient means; and if such an approach involved laying service-pipes along and not across the road, this could not convert a service-pipe into a main. The most important attribute on which plaintiffs relied was the capacity of the pipe. It was said the capacity was such that it would deliver at the foundry a quantity of gas largely in excess of the requirements of the consumer, and that by its means the intervening houses might be supplied. But if and when the defendants tapped this pipe for the purpose of supplying

these houses, different questions might arise as to whether they had not, by their act, converted a service-pipe into a main. But he had to decide the case on the evidence as it stood; and he was quite satisfied that the pipe was laid, and intended to be used, as a service-pipe. Under these circumstances, the action would be dismissed with costs, including those of the motion [see "JOURNAL" for April 15, p. 188], which were reserved until the trial.

WATER CHARGES TO LICENSED CATERERS.

In the "JOURNAL" for the 18th ult., we gave a report of the arguments in the appeal to the House of Lords by the Metropolitan Water Board from a decision of the Court of Appeal, affirming one by the Divisional Court, in the case of an action brought by the Board in the Westminster County Court, in regard to their charge for water to certain licensed premises in John Street, Minories. It was contended on behalf of the appellants that the water for cooking, washing-up the plates and dishes, and scrubbing the floor in connection with the business was not water used for domestic purposes, but for the purpose of a trade or business within section 25 of the Metropolitan Water Board (Charges) Act, 1907, and that such use of the water was not covered by the charge made for a supply of water for domestic purposes. The County Court Judge gave judgment for the appellants for the amount claimed (5s.). At the close of the arguments, it was mentioned that, if it were necessary to hear those for the respondent (Mrs. Avery), intimation would be made to that effect. This remark was regarded as equivalent to a decision to dismiss the appeal; and last Friday it was done. Lord Halsbury said that to give to the phraseology of the defining section of their Act the meaning which the appellants sought to put upon it in the case, would be to enact what it was, he thought, absolutely certain the Legislature never intended. Lord Dunedin said the appellants contended that every use of water, however domestic in its nature, that appeared as a step, however insignificant, in a trade operation, was use of water for a trade, and therefore non-domestic. The great objection to this view was that it went so far and led to such astounding results as to make it flagrantly in conflict with what he ventured to call the common-sense view of the Act. Lord Atkinson gave judgment to the same effect, and Lord Kinnear concurred. The appeal was accordingly dismissed, with costs.

PUBLIC AUTHORITIES PROTECTION ACT.

A Case from Bradford.

In the King's Bench Division of the High Court of Justice last Thursday, before Mr. Justice Bray and Mr. Justice Lush, judgment was given in an appeal from a decision of the Bradford County Court in a case brought by a Mr. Myers against the Corporation.

From the facts stated, it appeared that in the autumn of last year the plaintiff ordered a ton of coke from the Bradford Corporation, whose servant, in delivering it, tipped the cart to shoot the coke down the coal-hole in the pavement, but sent it through plaintiff's shop window instead. Over six months afterwards, the plaintiff brought an action for damages for negligence. Liability was denied; and the Corporation also set up the defence that, as the action had not been begun within six months of the injury complained of, they were exempted from liability by virtue of the provisions of section 1 of the Public Authorities Protection Act, 1893. The Jury found in favour of the plaintiff, with damages £17; but the County Court Judge gave judgment in favour of the Corporation, on the ground that they were protected by the Statute.

On the appeal, it was argued for the plaintiff that the Statute in question only applied to obligations imposed upon an authority, and not to a case like the present. where the power to sell coke was a permissive one. For the Corporation, it was held that in selling the coke they were acting in pursuance of a statutory obligation under their Gas Act to get rid of it; and as the accident occurred in the discharge of this obligation, they were protected by the Act. The fact that there had been a contract between the parties did not affect the question. The material point was whether the carter was guilty of negligence.

The appeal was dismissed; the Court being divided in opinion. Mr. Justice Lush expressed the view that authorities were not protected by the Act when, in pursuance of their statutory powers, they had undertaken obligations towards an individual in the discharge of which negligence arose. On the other hand, Mr. Justice Bray held that the coke was sold and delivered by the Corporation in the execution of their public duty or authority, and that they were entitled to the protection of the Act in respect of negligence of their servant. Leave to appeal was granted.

James Keith and Blackman Co., Limited v. The Tilley High-Pressure Gas Syndicate, Limited.

Further in reference to the paragraph which appeared in the "JOURNAL" for the 25th ult. (p. 698), in regard to the above matter, we have been asked to supplement the statement in the "Legal Intelligence" in last week's issue, to the effect that the parties have come to terms of settlement as to the various points in the judgment in the recent action, and that the injunction granted by the judgment stands and holds good in its entirety. But the claim for damages made by the plaintiffs was dropped.

Mr. A. Docking, the representative of the Selas Lighting Company, having addressed the Ballymena Urban District Council with respect to the advantages of the Company's system of lighting as compared with electricity, his offer to instal a gas plant in the town, free of cost, for the purposes of demonstration, was agreed to.

MISCELLANEOUS NEWS.

STRIKE AT LEEDS GAS-WORKS.

The dissatisfaction of the Leeds Corporation employees who are members of the Gas Workers and General Labourers Union with the concessions granted them in response to an application for an all-round advance of 2s. a week in wages, came to a head last Wednesday night, when nearly 3000 of the men went on strike. On the previous Sunday, a meeting was held, with Mr. J. R. Clynes, M.P., in the chair; and it was then decided that the strike should be undertaken to enforce the employees' demands. The day before this, the Lord Mayor of Leeds (Mr. E. A. Brotherton), at a dinner of the local Association of Engineers, had stated that, so long as there was no strike and no labour disturbance in the city during his term of office, he would subscribe to the General Infirmary and the Dispensary £50 per week, in such proportions as he might think fit. Another mass meeting was held on Wednesday night, when, among others, Mr. Will Thorne, M.P., addressed the men. A letter was read from the Lord Mayor offering to convene a conference between the parties; but it was resolved that this had reached the Federal Council too late, and that they must adhere to their previous determination to ask all men to cease work immediately.

On Thursday, the scavenging and sanitary work of the city was entirely stopped; and most of the lamplighters also came out, with the result that the lamps in the suburban streets were not lit. The Gas Department were seriously hit by the strike; but the tramway men remained at their posts. Offers to work were received from some hundreds of men; and clerks and others in the employ of the city volunteered their services in any capacity in which it was thought they could be of use. A considerable number of these were sent to various gas-works, where preparations had been made for the volunteers to eat and sleep on the premises if necessary, so as to avoid coming into contact with the pickets. The Meadow Lane Gas-Works were reduced to a state of inactivity for a time on Thursday by the men quickly finding an excuse to "down tools," owing to the alleged use of "blackleg" labour. The coke slakers had struck; but the majority of the men had to give 28 days' notice before leaving work, or render themselves liable to prosecution under the Conspiracy Act. They gave in their notices, and the officials anticipated little difficulty in the production of gas for some time. However, soon after the six o'clock shift went on duty in the morning, one of the foremen commenced slaking coke. The retort and engine men regarded this as "blacklegging," and promptly left the works, though they were warned by the Manager that they were violating the law. In extenuation of their act the men urged that they had been instructed to stop if anybody but the regular coke slakers did the work; and the fact that it was one of the staff who had done it made not the slightest difference. At the other stations the unskilled men ceased work; but the skilled men, for the time being, at any rate, remained on duty. To economize in the supply of gas, the pressure was reduced, and the public were asked to use as little as possible. In the street lighting department, about half of the men employed struck work. A few lamps at odd places were lit by householders; and in the centre of the city lamp lighting was done (under police protection) by Corporation clerks.

Following upon the closing of the Meadow Lane works, there were no workers forthcoming at the York Street station on Friday afternoon. At two o'clock the men on the morning shift finished in the ordinary course, and after that time work was at a standstill. The most important gas-making plant is that at the New Wortley works, where the few men who remained loyal to the Corporation received assistance from a number of clerks employed in the municipal offices, who willingly volunteered their services. The clerks in the Education, Poor Rate, Water, and Gas Offices were drawn upon for this duty; and they were to be paid 7s. 6d. per day—other conditions of their engagement being that compensation would be provided should their clothes be spoiled, good refreshments given, sleeping accommodation found, and adequate police protection afforded. On Friday, the whole of the enginemen, firemen, boiler and retort men had left their work at the three stations. The Meadow Lane gas plant, however, was still in operation; the fires being kept going by the staff. Several members of the Gas Workers' Union were allowed to damp the fires during the early part of the day; but permission was afterwards withdrawn by the men's leaders.

Early on Saturday morning, by a majority of 904 on a ballot, the tramwaymen joined the rest of the strikers. They numbered 1200; bringing up to 4320 the total number of men out, representing the water-works, highways, electricity, sewage disposal, health, cleansing, street lighting, gas, and other departments. Perhaps, of all the departments, that of the street lighting occasioned the most concern; and on Saturday, in view of the diminished supply of electricity and gas light, cartloads of candles and lamps were imported into the city. During that day, the staff at the gas-works was reinforced by students from the Technological Departments of the University. This was the outcome of a purely voluntary movement on the part of the students, and had no official sanction from the authorities. This timely help enabled additional retorts to be brought into use and the gas supply considerably augmented.

According to the "Yorkshire Post," offers of assistance were pouring in from citizens in all ranks of society, and it was being more and more understood in the city that this is not merely a dispute about the details of wages between the Council and the men, but a question of most vital importance to the interests of order and good government. Our contemporary says there are many signs of defection among the strikers, and considers that "it should not be long before the whole thing fizzles out."

Mr. James Kincaid, the Engineer and Manager at Kirkcaldy, is to report to his Committee as to the comparative advantages of extending and improving the present gas-works and providing fresh works on a new site.

BLACKBURN GAS-WORKERS' DEMANDS.

Notices Expire Simultaneously To-morrow.

The threatened strike of Corporation workmen at Blackburn was brought nearer on Wednesday by the service of notices by the lower-grade employees in the gas-works, such notices expiring simultaneously on Dec. 17 with those of the workmen in other departments (*ante*, pp. 693, 763, 830).

The situation has not greatly changed since the last meeting of the Town Council, when, by a large majority, the men's application was refused. The chief concern of the townspeople is at present in relation to the Gas Department; for Blackburn is not only chiefly dependent upon gas for its street lighting, but also for the illumination of nearly all its cotton-mills. The vast majority of other places of business in the town use gas both for lighting and various power purposes. About 300 workmen are now stated to be affected; and of these over 120 are employed by the Gas Committee.

On Wednesday, the Gas Committee appointed three of their number to act as an Emergency Committee; and on the following day a statement was issued by the Corporation warning consumers not to rely upon a supply of gas after Dec. 17, adding that "the Corporation will not be responsible after the above-mentioned date for any failure of supply." This notification had the effect of giving reality to a dispute which many of the public hoped, and believed, would be amicably arranged in some way or other. A proposal from the local branch of the Independent Labour Party that the Mayor (Councillor Higginson) should call a town's meeting to consider the question has been rejected, "in view of the present critical condition of affairs."

Alderman Nuttall (Vice-Chairman of the Electricity Committee) referred to the dispute at a public meeting on Friday, and briefly reviewed the situation. He said that on Dec. 16, 1912, the question of wages was considered, and settled after many meetings by the different departments; increases in pay being made in most of them. These increases cost the Corporation something over £1400, which was equal to nearly ¾d. on the rates. The increases now asked for would probably cost the Corporation £2700 (equal to nearly a 1½d. rate) immediately, and probably more. This was altogether too drastic, as in all cases the Corporation were paying the full standard rate. The Corporation had, however, always been prepared to consider the positions of the different classes of men who worked under difficult and trying conditions; but they were not prepared to agree to wholesale demands made without discrimination.

LETTER FROM THE MEN'S GENERAL SECRETARY.

Our Manchester Correspondent writes that Mr. J. R. Clynes, M.P., General Secretary of the Gas Workers' and General Labourers' Union, has addressed the following letter to the Blackburn Corporation:—

> Your reply to our claim for an advance of the wages of the Corporation workmen is not only an adverse decision, but suggests that the only reason which has been adduced in support of the position is that the Corporation are paying the standard rate of 6d. per hour. That is the only reason given to the public. We beg to submit that it is quite unusual, and, we believe, entirely wrong, to compare the Corporation with private firms. That is not done when the salaries of Corporation officials have to be dealt with. They are compared, not with the employees of private firms, but with the servants of corporations and public bodies. The same rule should apply to workmen.
>
> We are entitled to ask that corporations should be compared with each other; and if Blackburn would like to be compared with the best, and not the worst, we may inform you that the gas workers in question get 6½d. per hour at Bradford, Halifax, Huddersfield, Leeds, Leicester, Nottingham, Oldham, Nelson, and Sheffield. In the case of stokers, we find that, while at Blackburn only 5s. 4d. per shift is paid, the rate at Tyldesley is 5s. 8d., Southport 5s. 6d., Doncaster 5s. 9d., Bolton 5s. 8d., Oldham 5s. 7d., Nelson 5s. 9d., St. Helens 5s. 6d., Wigan 5s. 9d., Bradford 5s. 8d., Burnley 5s. 7d., Manchester 5s. 6d., Warrington 5s. 6d., Sheffield 5s. 11d., Newcastle-on-Tyne 5s. 10d., Nottingham 5s. 9d., Hyde 5s. 6d., Leeds 5s. 8d., Birmingham 5s. 10d., Leicester 5s. 8d., and Salford 5s. 6d.
>
> When the Sub-Committee considered the claims of its labourers on Aug. 21, it decided in favour of 6½d. per hour for those labourers. That decision was not carried out, and has been suppressed. We believe the general body of ratepayers will agree that representatives on public bodies are failing in their duty when they withhold claims which in themselves are admitted to be reasonable, because they fear that if they pay more to corporation workmen they may be asked to pay more themselves to their own private employees. We do not think that private considerations should determine the action of men elected to determine public matters. This general refusal might cause provocation to corporation workmen, and compel them reluctantly to discontinue their duties in seven days unless the decision of the Council is amended."

The Fusing of a Switch.—The fusing of an electric switch is stated to have been the cause of a fire a fortnight since at a wholesale druggist and grocer's store in Belfast. Owing to the inflammable character of the stock, the flames rapidly got a firm hold on the premises, which were destroyed. Damage estimated at several thousand pounds was done.

Melrose Public Lighting.—The Melrose Gas Company have been successful in obtaining from the Town Council the street lighting of the Dingleton district of Melrose, in competition with the local Electric Company. It has been decided to instal the "A. & M." automatic lighting and extinguishing apparatus, together with the Alder and Mackay hurricane-proof lantern; and this installation will be operated by a booster which the Company have at present in the gas-works for boosting forward the gas to Newtown and St. Boswells.

BANBRIDGE GAS-WORKS EXPLOSION.

Death of Mr. Mearns.

The injuries received by Mr. G. A. Mearns (Manager of the Banbridge Gas-Works), in an explosion at the works, as reported in last week's "JOURNAL," unfortunately resulted in his death, which was greatly lamented by all sections of the townspeople, with whom he was very popular.

At the inquest on the body last Friday, a verdict of "death from exhaustion following on shock from burns" was returned. Hugh Adamson, an employee of the Gas Company, deposed that on the morning of Dec. 3 the exhauster was not working well, and Mr. Mearns went to examine it. He first examined the inlet, and found nothing wrong with it. He then went to the other side, and said he thought there was a little dent in it. Deceased sent a workman for a kettle of boiling water, and, as the man was rather long in returning, witness went to see what was the reason of the delay. He had just gone outside the door when he was knocked on the head. The machinery had been stopped before the explosion took place. When he got up, he heard Mr. Mearns call for help. Witness burst open the door, and pulled him out. Mr. Mearns was enveloped in a mass of flame. Witness, at considerable risk to himself, succeeded in getting the Manager out of the building. Deceased spoke to him only on two occasions afterwards. He could give no explanation as to how the explosion occurred.

Samuel Ewart, a stoker in the works, deposed to being sent for the water and to seeing Mr. Mearns carried away as he returned. Dr. Williams said deceased was very severely burned. His whole anxiety when witness saw him was about the works. Mr. Mearns told witness he was working at the exhauster when the explosion occurred, and that he was doing something that was risky; but he added that he had done the same thing many and many a time. The Coroner (Dr. A. Herron, J.P.) said it was a very sad case; and he thought Adamson deserved every credit for his pluck in dangerous circumstances.

The foreman of the Jury remarked that it was evident Adamson was greatly shattered in mind and body by his terrible experience, and the Jury would like to recommend him to the sympathy and appreciation of his employers and of the inhabitants of Banbridge. He hoped steps would be taken to bring Adamson's rescue of Mr. Mearns under the notice of the Carnegie Hero Fund Trustees. The Solicitor appearing on behalf of the Gas Company expressed deep regret at Mr. Mearns's death, and endorsed the suggestion that Adamson's heroic conduct should be reported to the Carnegie Trustees.

NEW SPIRAL-GUIDED GASHOLDER FOR OLDBURY.

Local Government Board Inquiry.

Last Friday, Mr. A. W. BRIGHTMORE, M.Inst.C.E., one of the Local Government Board Inspectors, held an inquiry in the Public Buildings, Oldbury, in regard to the application of the Oldbury District Council for sanction to borrow £6200 for a new gasholder. Among those present were Mr. C. Tomlinson (Chairman of the Gas Committee), Mr. S. Vernon (Clerk), and Mr. A. W. Cooke (Assistant Gas Manager).

The CLERK explained that the application was for sanction to borrow £6200 for a new holder at the gas-works. The holder was already fixed, and the reason for the inquiry being so late was that it was postponed from August last owing to the serious illness of the Engineer and General Manager (Mr. A. Cooke). Unfortunately, he was still too unwell to attend, and he apologized for his absence.

The INSPECTOR pointed out that the Local Government Board objected to sanctioning loans for work that had been done prior to the inquiry being held.

The CLERK said he was aware of it, and this was why he made the explanation. The Council asked for the repayment of the proposed loan to be spread over five years. The work had been commenced, and already a payment of £5000 had been made on account. With regard to the gas undertaking, during the past seventeen years £8950 had been handed over to the general district rate, £650 was paid for an old colliery adjoining the gas-works, £7000 had been spent on a carburetted water-gas plant, and £2350 for new regenerators. All these amounts had been paid, together with the cost of a station meter, out of revenue. No money had been borrowed for gas-works purposes during the seventeen years. The cost of the new holder would also have been borne by the revenue but for the fact that it was felt to be too heavy a strain upon the undertaking, which had already been somewhat tested in paying for the other improvements, and in having to bear the additional burden of the increased price of coal. With regard to the necessity for the holder, last year about 160½ million cubic feet of gas was sent out; while in 1881 the quantity was only about 58¾ millions. The storage capacity of the works prior to the erection of the new holder was 456,000 cubic feet; giving only from four to five hours' storage of gas in the winter months, when the whole town was on. With the new spiral-guided holder, the storage capacity would be increased by 500,000 cubic feet, and by the addition of another lift it could be further increased to 750,000 cubic feet. It would therefore be seen that prior to the erection of the new holder the storage capacity at Oldbury was wofully short; and in the event of a mishap to either of the other holders in the winter months it would not have been possible to store sufficient gas to keep the district supplied. The holder had been erected by Messrs. C. & W. Walker, Limited, of Donnington. The Inspector had very properly raised the question of the strength of the holder, having regard to an accident which happened to a similar one in another town. While, unfortunately, the Gas Engineer was not present to give evidence on this point, he had obtained from the makers certain calculations, and they were absolutely assured of its safety. Every precaution had been taken to place the holder upon a sound foundation; and in some parts the concrete was as much as 16 feet in depth.

The INSPECTOR inquired if there was now any chance of subsidence,

The CLERK said not the least, as fifteen or twenty years ago they purchased the colliery from which danger was threatened; and there had been no workings in the district for twenty-five years.

The INSPECTOR asked if independent tests of the holder had been made on behalf of the Council.

The CLERK replied that there had not, as they relied upon the makers' tests. He explained that the filling of the tank, which contained 150 tons of water, had been done very gradually, so that there would be no undue stress; and this occupied a month to complete. The tests were satisfactory; the holder had not moved at all.

The INSPECTOR expressed satisfaction that the holes in the plates of the holder were drilled instead of being punched.

The CLERK explained that the foundations for the holder cost £4187, of which the Council had paid £3000 by instalments; so that there was still £1187 owing on this work. The total cost of the holder and the work connected with it was £11,000; and it was because the Council felt that this would be too severe a strain upon the gas undertaking that they were applying for sanction to borrow the money.

There was no opposition to the application.

A vote of thanks was accorded to the Inspector, who, at the close of the inquiry, paid a visit to the gas-works.

CONSOLIDATED GAS COMPANY'S NEW BUILDING.

A Marvel of Construction and Equipment.

The current number of our American contemporary "Gas Logic" has on the second page of its wrapper a coloured view of the gigantic new building of the Consolidated Gas Company of New York, which is rapidly approaching completion; and in the number itself is an article on its construction and arrangements. In the "JOURNAL" for Dec. 12, 1911, we gave a view of the first section and a few particulars of the new building; and as it is one of the largest and most completely equipped structures in the world devoted to the lighting business, we supplement our previous account by the following additional details extracted from the article above referred to.

The building has been erected on the site of the old four-storey brick building put up by the Manhattan Gas Company in the early part of the last century. It stands in Irving Place and Fifteenth Street, and is one of the finest structures of any kind in the entire city. It will cost close on $2,500,000, and, when fully completed, will house all the administrative departments of the Lighting Companies of Manhattan and the Bronx. Constructed of Indiana limestone, it stands nineteen storeys, or 257 feet, high, and has a frontage of 84 feet on Irving Place and of 297 feet on Fifteenth Street. Hundreds of light and airy offices are scattered about its numerous floors, with total accommodation for 2000 executive and department heads and other employees. There are four entrances; the main one on Fifteenth Street being of Pavanozza marble, and leading into a magnificent marble corridor.

By far the most remarkable feature of the building, and one which has made it a marvel in structural engineering, is that a large part of it on the Fifteenth Street side hangs from huge girders instead of being constructed in the usual way. Five of its storeys are here suspended between two nineteen-storey structures over one of twelve storeys which was built a year or so ago, but was not designed to take the additional weight of the larger building finally decided upon. This suspended portion—literally built from the top downwards—is the only hanging building in the world. In order to sustain the enormous weight of the hanging floors, eight steel girders, each 63 ft. 8 in. long and weighing 40 tons, had to be carried across high above the original building; the girders themselves being supported on steel columns 250 feet high. These in turn rest on steel and concrete footings, reaching down to bed-rock. The actual lifting and placing of the eight girders was a wonderful feat in itself—so wonderful, in fact, that the work of raising them by a powerful derrick from the street to the top of the structure is being shown in moving pictures all over the country. The actual hoisting and placing of the last girder was done in 12 minutes.

The illuminating features of the building will make it the most brilliantly and beautifully lighted structure in the city. The entire face to the tenth floor is divided into bays with artistic panel effects, all of which will be outlined with lights; while thousands of large and small indirect lamps dotting the upper storeys, and outlining even the slightest details of the roof and the ornamental cornice, will combine to make the building a glowing landmark nightly. The interior lighting arrangements will be equally novel and absolutely perfect in every way. One splendid lighting effect never before tried in any building will be seen in the main corridor on the ground floor, where concealed lights shine through thin marble panels set into the walls at intervals, and produce a beautifully soft light-tone.

On one of the upper floors of the new building there will be a fine auditorium, fitted with a stage and with a seating capacity for several hundred persons. This will be used chiefly for lectures and entertainments and in connection with the growing educational work of the Company among their employees. The nineteenth floor will be devoted to a restaurant, where nearly 500 employees can be comfortably fed at a time, and to a completely equipped gas kitchen, which will be second to none in the city.

The telephone exchange will be the largest commercial telephone exchange in the city. It will handle all the trunk line telephone service between the different offices in the building and the outlying branches, besides providing for all connections between the public and the Company. Some idea of the enormous importance and volume of business of the Company which will be carried on over the wires leading to this exchange will be gained when it is stated that the fourteen operators assigned to the building will look after a daily telephone traffic equivalent to the needs of a city of no less than 25,000 inhabitants.

Part of the basement of the new building will be devoted to a permanent display of industrial gas appliances, and part will be set aside for vaults for the records.

THE DESSAU VERTICAL RETORT IN ENGLAND.

In the "Fuel Number" of "The Times," to which attention was called in our editorial columns last week, there was an article on carbonization plant, in which reference was made to the Dessau system, which, it was stated, had "never succeeded in obtaining a foothold in this country." This statement was denied by Mr. C. Holmes Hunt, the Secretary of the Vertical Gas-Retort Syndicate, Limited, in the following letter, which appeared in the Engineering Supplement last Wednesday.

This system of carbonizing has not only obtained a foothold in this country but is growing in favour both here and also in the Colonies, as shown by the installations erected to the order of the following gas undertakings—viz., Sunderland, Birmingham, Leeds, Hull, Melbourne, Auckland, Wellington, &c., no fewer than six of the orders now on hand being "repeat" ones. When it is remembered that this system is of German origin, the slow rate of progress made by it as compared with the two continuous systems, which happen to be both of English origin, may not perhaps be difficult to understand. Moreover, continuous carbonizing has undoubted attractions to the engineer from an idealistic point of view. But however that may be, for low labour costs, high carbonizing results, and all-round economy of working, this system is superior to any other system of carbonizing, as can be proved by reference to actual results.

The article further ascribes to this system "the comparative difficulty of varying the illuminating power of the gas made in it at will, and maintaining with all classes of coal the high standard which is still demanded by legislation." This is exactly the criticism to which it was subjected at its introduction into this country five or six years ago, based upon the disregard in Germany of illuminating power—a practice which, with the sanction of Parliament, is likely to become in the near future universal. This criticism was silenced by the results obtained from the first installation erected at Sunderland, which confirmed the views of the supporters of the Dessau system—viz., that, in actual working experience, the system is capable of satisfying any reasonable standard of illuminating power with all classes of coal. The system further has the advantage over all other carbonizing systems in that by using steam (which is entirely optional) the yield of gas per ton of coal carbonized can be greatly increased at will without a proportionate reduction of either illuminating power or calorific value. Not only, therefore, is it a system producing a high standard of illuminating power at the lowest possible cost, but it is also the system *par excellence* by means of which a high production of what is undoubtedly the gas of the future—low-grade gas—can be obtained.

PROPOSED TAR PRODUCTS AND BENZOL ASSOCIATION.

[From the "Iron and Coal Trades Review," Dec. 5.]

The production of coke in recovery ovens has grown to such dimensions during the last few years that the output of such bye-products as sulphate of ammonia, tar and tar products, and benzol constitutes a very real addition to the national wealth. Coincident with the production of bye-products comes the question of their profitable disposal. Markets have to be found, propaganda instituted where necessary, and such arrangements effected as will assist in the establishment of a balance of supply and demand, so that increasing output is met with a corresponding growth of consumption. As for sulphate of ammonia, a Committee already exists to guard its welfare. This Committee levies a toll of a few pence per ton; and the money thus obtained is devoted to propaganda, both at home and abroad, in conjunction with foreign societies with similar aims. The Committee utilizes expert technical experience to aid its efforts at home, and generally is to be congratulated in that it places at the disposal of the members accurate statements as to current values. As the bulk of this product is exported, we should think that foreign statistics concerning consumption and visible supply would be of some use in enabling members who contract their output over a period to forecast the future position.

Concerning tar, tar products, and benzol, there is no known Association of producers with aims similar to those of the Sulphate of Ammonia Committee; and it would appear that there is really room for such an Association. In this, our contention is to some extent supported by a recent meeting of crude benzol producers and the distillers of this product, to determine some suitable price basis. Producers of tar who do not distil the product are limited in their market to local distillers. There is little competition, and the basis of sale is either a fixed price per ton, or a sliding-scale fluctuating with the prices fixed from time to time by a third party, or otherwise, for the various products—a specific deduction being allowed the distiller for working expenses, sales charges, and profit. Now, the markets for the various constituents of coal tar are widely separated, numerous and diversified influences operate to depress or raise values; and thus it can be said that manipulative effort concentrated on a particular product often operates to the disadvantage of the producer of tar, whether he himself distils his produce or sells it to one possessing the requisite apparatus. There are no real means of finding the intrinsic value of a product. Published prices too often reflect the views of middlemen; and thus one from time to time reads letters of protest indicating dissatisfaction with the course of published values. Pitch will move violently (on paper) with no transactions of moment having been recorded; while the actual consumer is taking his supplies steadily, and paying a definite sum. Benzol is reported in over-supply, and one is astonished to hear that producers have sold ahead for a year, and that the motor press is grumbling on behalf of its readers at the foolish policy of exporting valuable produce for the sole benefit of Continental neighbours.

This is a condition of affairs which is not in the interest of the owners of bye-product ovens. What is wanted is a clear and comprehensive view of the position, statistics as to production and consumption, and above all an accurate price record. This, we contend, can only be

accomplished by an Association, the results of the formation of which would be that the price of crude tars could be more efficiently regulated, producers would have accurate data as to the course of values of products, and those with distilleries would know exactly what was profitable, and what turn demand was likely to take. Concerted action in distributing products, especially oversea, should also lead to better and cheaper facilities than individual action. It is generally understood that a tar-distillation plant is quite a profitable feature as an adjunct to recovery ovens; but doubtless the policy of owners is influenced by the question as to the disposal of the products, which would in any case be much simplified by the collection of data, and by hesitancy as to the amount of skill required in operating the plant. A modern plant, as a matter of fact, needs very little supervision, and the various tests can be readily undertaken by the coke-plant chemist or manager. A reference to benzol, which, of course, would come within the scope of the Association, is necessary in view of the position it now occupies in the motoring world. Propaganda is still needed. A proper standard of quality must be set, in order that no harm accrues through the sale of badly finished products; and it is superfluous to indicate that the whole present and future output can be absorbed with ease at home.

In conclusion, we append some statistics relating to the export of tar and benzol products for the first ten months of the present year.

Benzol and toluol	5,700,690 gals.	valued at £	260,369
Carbolic acid	14,878 cwt.	,, ,,	161,054
Crude tars	95,553 ,,	,, ,,	16,031
Refined tars, &c.	2,654,969 gals.	,,	58,659
Naphtha	427,985 ,,	,,	19,987
Naphthalene	75,670 cwt.	,,	33,204
Pitch	7,548,270 ,,	,,	864,818
Creosote	31,716,658 gals.	,,	511,249
Various products not enumerated	593,641 ,,	,,	250,292

The total value, which includes one small item not referred to above, is £2,202,479, which is well over £620,000 more than for the same period last year. Sulphate of ammonia during that period produced £3,673,076 from abroad; and we submit that, in comparison, and bearing in mind the many important developments yet possible in the distillation of tar, such as the production of various fuel oils for internal combustion motors, &c., an Association would be very useful in every sense.

BURTON-ON-TRENT GAS UNDERTAKING.

Projected Extensions at the Works.

The Gas Committee of the Burton-on-Trent Corporation have had under consideration the question of extending the retort-house and plant at the gas-works. The maximum capacity of the present retort-houses only leaves 2,070,000 cubic feet per day as the safe working capacity, and for the last few years the maximum winter day's output has been increasing at the rate of about 7 per cent. Bearing in mind the requirements of Rolleston and Tutbury, which will have to be met next winter, and the large number of gas-fires which are now being fixed, an extension of the retort-houses must, the Committee state, be made before next autumn if they are to be in a position to maintain a proper supply of gas during the depth of winter. It is proposed next year to extend the new retort-house as far as possible over the present open yard space, and erect four beds of retorts complete with the necessary ironwork, &c., at an estimated cost of about £5000. These four beds will increase the capacity of the house by about half-a-million cubic feet per day. After these four beds have been erected, the retort-houses cannot be extended any more until the block of buildings containing boilers, engines, exhausters, pumps, &c., is cleared away, and the plant there re-erected or replaced by new on the river side of the works. When this has been done, there will be room for six more beds of retorts, making ten in all; thus doubling the present capacity of the new retort-house. The Committee recommend that the scheme for doubling the capacity of the new retort-house by extending it, and removing the exhausting, condensing, and washing plant from its present site and re-erecting it, with additions, near the river side, be adopted and carried out; and that the Finance Committee be requested to make application to the Local Government Board for sanction to borrow £20,000, the estimated cost of the work. As it is essential that the present carbonizing plant should be extended before the winter of 1914-15, the Committee further recommend that they be authorized and directed to obtain tenders for the first section of the extension, comprising the erection of four beds of retorts with the necessary building work and ironwork on the yard space between the boiler-house and the present end of the new retort-house, at an estimated cost of about £5000 (being part of the £20,000 scheme).

The report was submitted to the Town Council at their monthly meeting on Wednesday last, and, in moving its adoption, Alderman Lowe, the Chairman of the Gas and Electricity Committee, explained that at the present time they were capable of manufacturing a little more than 2 million cubic feet of gas in 24 hours. They expected that if the rate of increase were maintained they would require this quantity daily next winter, and then their plant would be insufficient to make it. He ought to remind the Council that when the large new retort-house was put up only half of it was actually erected. They now proposed to erect four new beds of retorts between the boiler-house and the end of the retort-house at a cost of £5000. The four extra beds would enable them to make sufficient gas until 1918; but they must recollect the retorts would not be ready for a year. He must point out that the amount, £5000, was included in the £20,000 scheme. If the increased consumption went on, they would then find after 1918 that they had to provide still further extension of the retort-house. The work would have to be done in 1915, in order that in 1917 they could complete the house at an extra cost of £10,000. He felt satisfied that the money would be well invested, and that they would have an ample return for it.

Some considerable discussion ensued, and in the result, the report was adopted.

COOKING-STOVES FOR PREPAYMENT GAS CONSUMERS AT SALFORD.

Free Supply and Fixing.

The Gas Committee of the Salford Town Council have approved a report by the Gas Engineer (Mr. W. W. Woodward) on the question of supplying and fixing cooking-stoves free of charge to consumers of gas by prepayment meters, and have adopted the recommendations contained therein.

Mr. Woodward points out that the total number of prepayment meters in use on the 31st of October last in the whole area of supply was 31,267, representing a capital value of £67,052. In addition to this, there was a floating stock of 722 meters, equivalent to a capital value of £1549, and also prepayment meter fittings fixed on consumers' premises at the above date representing a capital value of £9800. The whole of the prepayment meters at present in use are of the three-light size, whereas the proper meter for use with a gas cooking-stove is the five light size. Mr. Woodward states that it is quite out of the question to contemplate the immediate scrapping of 31,989 meters; and though a three-light meter is not sufficiently large to give absolute satisfaction both to the consumer and to the Corporation when used with a cooking-stove, there are several towns where these meters are used for this purpose with a certain amount of success. If the Gas Committee should decide to supply cookers with prepayment meters, he would not recommend the immediate scrapping of any of the existing meters, but would propose that all new prepayment meters purchased be of the five-light size, so that the change would be spread over a considerable number of years, and the three-light meters would only be scrapped as they became worn out.

A suitable cooking-stove for use with a prepayment meter can be obtained for 35s., and the expense of delivering and fixing it on the consumer's premises would amount to about 15s.—a total cost of 50s. for a cooker fixed complete. To this should be added something for the extra cost of the larger meter which would eventually have to be supplied. He put this at 6s.; so that the cost of the stove and fixing would be 56s. Interest, redemption, repairs, and maintenance, at 15 per cent., would be equivalent to an annual charge of 8s. 5d.; but against this would be the profit obtained from the gas used for the stove. The quantity per annum would be about 8000 cubic feet, which at 1s. 1·57d. per 1000 feet would amount to 9s. 0½d., which is more by 7½d. than the standing charge of 8s. 5d. on the cooker. In other words, the Council would have a profit per prepayment meter cooker of 7½d. per annum. Under these circumstances, and provided proper safeguards are taken to ensure that the cookers will be used when fixed, the Engineer had no hesitation in recommending the Committee to supply (and fix free) cooking-stoves with prepayment meters.

ELECTRICITY SUPPLY IN LONDON.

Progress of the Undertakings.

In view of the proposed amalgamation of the London Electricity Supply Companies, a return which has been issued by the London County Council, giving particulars of the existing sources of supply, is of considerable interest. In 1911-12, to which the return relates, the authorized distributors in the Metropolitan area comprised sixteen Metropolitan Borough Councils, eight Municipal Corporations, eighteen Urban District Councils, and thirty-three Companies. As regards undertakings within the county, the total number of units generated was 328,279,805, of which Borough Councils contributed 118,749,549 and Companies 209,530,256. The aggregate revenue of the former was £829,815, which works out at rather more than 2d. per unit, while that of the Companies was £1,753,248, representing 2·62d. per unit.

With regard to financial results, the return shows that six Borough Councils paid over to the relief of the rates an aggregate of £97,537, while five had to make good out of the rates deficits aggregating £187,356. The average rate of the interest and dividends paid by the fifteen London Companies, calculated on the total capital raised, was 5·11 per cent. At the end of 1911-12, the net expenditure charged to capital totalled £6,581,198 in the case of Borough Councils, and £14,437,257 in the case of the Companies.

The following figures show the progress of the London undertakings in a period of seven years:

	Borough Councils.		Companies.	
	1905-6.	1911-12.	1905-6.	1911-12.
Capacity of plant in kilowatts	52,657	80,603	128,175	153,479
Units sold—				
Street lighting	9,181,983	13,405,061	4,201,377	4,097,118
Other lighting	24,242,981	37,945,681	96,678,098	86,653,358
Power and heating	9,573,354	45,473,188		61,727,949
Traction supply	..	41,348	18,211,137	8,219,070
Bulk supply	..	..	456,122	..
Totals	42,998,318	96,865,278	119,546,734	160,697,495

Particulars of the bulk supply furnished by the Companies in 1911-12 are not available; but in 1910-11 the total number of units sold under this heading was 1,212,567.

We learn that the series of four photographs, showing retort charging and discharging operations by means of the combined machine patented by Drakes Limited in comparison with old methods, which they had on view at the National Gas Exhibition, have been secured on loan for the Science Museum, South Kensington, by His Majesty's Board of Education.

A CUMBERLAND COUNCIL AND COKE-OVEN GAS.

In the Town Hall, Maryport, last Wednesday, an inquiry was held by Mr. T. C. EKIN, M.Inst.C.E., on behalf of the Local Government Board, into an application by the Urban District Council to borrow £2600 for the purpose of distributing gas at Flimby; the village, which is 1¼ miles from Maryport, being within the Council's lighting area. As the result of prolonged negotiations, the District Council and the Parish Council have come to an agreement on the matter. Some of the members of the latter Council were in favour of taking gas from the coke-ovens of the Flimby Colliery Company, who had previously been in correspondence with the District Council respecting the selling of a supply to that authority.

In supporting the application, the Clerk to the Council (Mr. F. Kelly) referred to the negotiations which had taken place, and said they had fallen through because the coke-oven owners asked too high a price. Middlesbrough had secured a supply of gas from coke-ovens at 4d. per 1000 cubic feet; and if the Flimby people had quoted any such figure, the Council would have been asking for powers to take coke-oven gas. Dealing with the finances of the gas undertaking, the Clerk said the total loans sanctioned amounted to £45,000, all of which had been spent except £2840, which sum was borrowed for the extension of the gas-mains to Flimby. A Provisional Order to sanction the borrowing of £15,000 for the general purposes of the gas undertaking was now asked for; and of this sum £2600 was required at once for service-pipes and fittings to the houses at Flimby. All fittings installed in the town were paid for out of revenue. There was an idea that the gas undertaking had too much capital; and the Council charged as much as possible to revenue.

The INSPECTOR said this was a very wise policy. He wished everybody would do the same. Some people thought it desirable to make the capital as large as possible.

It may be added that since the negotiations between the District Council and the Colliery Company were broken off, the question has assumed a new aspect, as a project is on foot for forming a local Company which will take over and develop the Ellenborough Colliery, and erect a battery of sixty bye-product ovens; and among the sources of revenue of the proposed new Company the sale of their waste gas to Maryport is named. The colliery is within the urban district, and therefore favourably situated for supplying the gas.

MIDDLESBROUGH CORPORATION AND THE NORTH ORMESBY GAS-WORKS.

Agreement to Purchase.

It may be remembered that the Middlesbrough Corporation have given notice of their intention to promote a Bill next session to authorize them to acquire the undertaking of the North Ormesby Gas Company. The matter was considered at a recent meeting of the General Purposes and Parliamentary Sub-Committee of the Corporation, when it transpired that the Sub-Committee had interviewed two Directors of the Company, and discussed the offer made to sell their undertaking to the Corporation for £30,000. The Sub-Committee informed the Directors that the price asked was too excessive. After fully considering the matter, the Directors stated that the lowest price they were prepared to accept was £26,000—the Corporation, in addition, to settle the compensation payable to the Secretary and Manager under the Middlesbrough Extension Act, 1913; this arrangement to come into force, and the Corporation to take possession, as from the 31st inst. The Sub-Committee unanimously recommended that this offer should be accepted. This was subsequently confirmed.

A special meeting of the Town Council was held last Tuesday to consider the Bill. Councillor Calvert referred to the provisions relating to the testing of gas, and explained that the adoption of the calorific test was made on the recommendation of expert gas engineers. It did not militate in the slightest degree against the consumer, but acted ultimately in his favour. The Bill was amended in certain particulars, and finally approved.

With reference to a claim for £1233 by Mr. T. Weatherly, the Secretary of the Company, the Mayor (Alderman Bruce), Alderman Hinton, and Councillor Calvert (the Chairman of the Lighting Committee) were given plenary powers to settle the matter.

DISPOSAL OF GAS PROFITS AT OLDHAM.

At the last meeting of the Oldham Town Council, a number of questions were asked upon the accounts of the Gas Committee. One member said it was stated in the course of the recent municipal elections that £26,000 profit had been made, but only £7500 went to the relief of the rates. He made it out that during the year they had £26,843 profit, in addition to the £7500 referred to, or a total of £34,343. If this was a fact, what was the balance of the gas-works surplus, and what proportion was paid to the out-districts? If the surplus did not go to the out-townships, what became of it? Another member asked how much the Corporation had paid for street lighting and the lighting of public buildings since the last local Act of Parliament was obtained, before which they had never paid a penny.

The MAYOR (Alderman H. Wilde, who is also Chairman of the Gas Committee) said the net profit on the gas-works last year was £16,505, and there was a balance of £19,488 brought forward; making an available total of £35,993. They contributed to the rates £7500, and placed £1650 to depreciation; making £9150. The balance remaining was £26,843, which was carried forward. So that during the year they had increased their balance by £7400 in addition to the contribution to depreciation. This was carried to the current account; so that if they had any disaster, or a large increase in the price of coal and a fall in the price of coke and residuals, as they were experiencing now, they could still sell gas at the price they were charging to-day. If they had as good a result at the end of the current year as they had at the end of last year, it was possible that they would reduce the price of gas. As to the cost of the lighting of the streets and public buildings, it was about £6000 or £7000. With regard to the out-districts (Royton, Lees, Failsworth, and Chadderton), they would only get the advantage which might accrue from a reduction in the price of gas.

GAS COMPANIES AND SMOKE ABATEMENT.

Lecture by Professor Lewes.

A lecture on "Smokeless Fuel and the Relation of Gas Companies to Smoke Abatement" was delivered recently, in the Berkeley Hall, Glasgow, by Professor VIVIAN B. LEWES, F.I.C., F.C.S.

Bailie N. B. SMITH, who presided, said that in the whole history of the gas industry there never was a time when its prospects of usefulness to the community were so great as they are to-day. Coal gas, originally intended for lighting only, had become a necessity for cooking and heating in the house and for many manufacturing processes in the workshop; and now that public feeling was so strongly roused to the necessity for a purer atmosphere as essential to the better health and longer life of the community, the scope of gas using was greatly enlarged. The pressing need for smokeless fuel demanded that their energies should be specially directed to two objects, which fortunately were not antagonistic to each other. In the first place, they would want much larger quantities of gas at greatly reduced prices; and, secondly, they required for many purposes a better bye-product than the present form of coke—something that could be burnt in ordinary grates. The increased price the public would be willing to pay for better coke should materially contribute to a reduced price for gas.

Professor LEWES said the pollution of the atmosphere arose from the fact that it was impossible to burn coal in any grate simple enough to be adopted generally without at the same time decomposing it and distilling off some of the more volatile constituents. The smoke curse depended on our methods of burning bituminous coal being a combination of distillation and combustion. The more the former predominated, the more injurious were the results. The use of bituminous coal was indefensible from any point of view; and those desirous of seeing the atmosphere cleansed, and life restored to its natural conditions, had a strong case in pleading for the enforcement of reforms. It would be useless, however, to ask Parliament to place a ban on the use of bituminous coal until they were ready to show how its place as a fuel could be filled satisfactorily. There must be ready to hand a solid fuel, easy to ignite, burning with a cheerful, bright, and smokeless combustion, as cheap as coal, and usable in the same grates as coal. Unfortunately, coke as produced in the ordinary practice of gas-works and metallurgical coke made in the coke-oven were unfitted for use alone in the domestic grate, owing to the temperature at which they have been made having driven out all the volatile matter which they contained—thus rendering them difficult to ignite and causing them to give a dull instead of a bright fire; while the absence of flame reduced the chimney draught and gave the chance of sulphurous fumes occasionally finding their way into the room. The time was ripe and the public were fully educated to the idea of a fuel like coalite which would be strong enough to bear handling; and many were at work upon the problem of how best to make it. In Glasgow, that *doyen* among carbonizers—Dr. George T. Beilby—was attempting the carbonization of coal at low temperatures and in thin layers. In London a process was being tried of carbonizing at low temperature in high vacuum; in Birmingham, Professor Burstall was trying the effect of moderate vacuum at ordinary gas-making temperatures; while Mr. Richards was trying the effect of carbonizing on an endless band. It might be asked: "Why do not our gas-works at once step in, make a fuel like coalite, and give us the advantage of the high quality gas?" The answer was that no one knew how to make the fuel successfully, and that high candle-power gas was not fitted for either gas-fires or incandescent mantle burners. The time, however, was at hand when the solution would be found, and then the gas-works should become the gate through which all domestic fuel must pass, yielding up its bye-products, and enabling us to create power and heat without polluting the air and wasting our natural supplies. The gas companies were already the most valuable factor in smoke abatement that we possess; and the public were rapidly grasping the fact that the modern gas-stove was every whit as healthy as the coal-fire, and that, even if the cost was a little greater, the difference was amply made up for by the cleanliness, convenience, and even temperature obtained. The advance in the use of gas as a domestic fuel had been phenomenal; and it was calculated that the gas-stove and gas-cooker in London had replaced one-sixth of the coal-fires, and reduced the consumption of coal by nearly a million tons per annum.

BUSINESSLIKE APPLICATION OF GAS.

Mr. Matt. Dunn, of the Stockton Corporation Gas-Works, recently delivered a lecture to local tradesmen on lighting, heating, and ventilating shops. At the outset the lecturer dealt with the composition of coal gas of an average quality, and demonstrated how the flame temperature varied with the admixture of air. He then spoke upon luminosity, and drew attention to the fact that, while gas-works are compelled to make daily tests and records, electricity suppliers are free from any such restrictions, and often base their candle values on the Hefner or German standard, which is lower in value by 10 per cent. than the English candle standard.

Mr. Dunn went on to discuss the calorific value of coal gas, and described the effect which this has on up-to-date methods of lighting. For instance, he said, a burner using 40 per cent. of primary air and

collecting 60 per cent. of secondary air in complete combustion would give a temperature or calorific value of 2800° Fahr., and about 20 candles per foot of gas consumed; but if the mixture was reversed, so that 60 per cent. of primary was taken in at the air-holes of the burner, *plus* 40 per cent. round the flame, this would give an increased temperature of 200° (3000° in all) and produce a lighting power of about 30 candles per cubic foot of gas consumed. Various types of burners were exhibited, and much sound advice given with regard to the selection of these, their construction, location for best results, and economic manipulation. Burners were fitted up with gas and air adjusters to show how defective lighting, due to lack of pressure and other causes, could, by means of these adjusters, be regulated to meet every possible emergency.

The subject of meters was next taken, and consumers of gas were strongly urged to take greater interest in the behaviour of their meters. He emphasized the fact that it is important to industrious and business-like tradesmen to give the same care to the gas burners and meters as they do to the dusting of counters and wares exposed for sale. Cleanliness in regard to burners, nipples, globes, &c., was, he added, of immense importance, and must on no account be neglected. He also urged that daily readings of the meter should be taken, and explained that by following such a rule the consumers would soon be made aware of leakages.

The effect of globes and wallpaper upon the illuminating power of gas was demonstrated, and valuable hints upon effective lighting given. The lecturer next showed how it is just as possible to have instantaneous ignition and extinguishing with gas as with electric lights; and he also took into consideration costs, and compared the price of gas with that of electricity. He stated that an Osram lamp for 10,000 candle-hours, at 2d. a unit, which he contended was a low rate, would run out at 2s. 1d.; while the ordinary incandescent burner, with gas at 2s. per 1000 cubic feet, would give 10,000 candle-hours for 1s. With high-pressure gas giving 60 candles per foot, they found that 10,000 candle-hours of lighting at 2s. per 1000 feet would cost 4d., and at 2s. 6d. per 1000 feet 5d. These calculations could also be applied to heating, and would show how much cheaper was gas heating than electric.

Touching upon the question of the heating of shops, Mr. Dunn told his audience electrical radiators were nothing more than convected heat generators. It was thoroughly understood that convection was injurious to any atmosphere; and the principle of convected heating was abandoned by gas-fire makers a few years ago. The general adoption of gas-fires was because of the fact that they did away with convected heat. The ventilating properties of gas were also worthy of great consideration. In conclusion, he mentioned, with regard to the heating of shops, that this could be very effectively done by a hot-water circulator in the basement, heated by gas. There would be no fumes allowed to come in contact with the atmosphere. Further, with regard to flueless radiators in open spaces, lofty rooms, or corridors, there could be no fear about pollution of the atmosphere accruing therefrom which might be described as detrimental to health.

The lecturer intimated that it was from a keen desire to upheave a wrong impression with regard to gas lighting that he had undertaken the work of showing how gas could be applied in a businesslike way.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

It was a great pleasure to see the good turn-out of the Edinburgh Section of the Scottish Juniors at Messrs. R. & A. Main's works this afternoon. It showed that when a firm are willing to exhibit the methods of manufacture of important articles of daily use by gas consumers, the Juniors are prepared, in their turn, to take advantage of the chance offered to learn how these articles are made. It is also evident that those whose work lies in the distribution departments are more eager for information than those engaged in the making of the gas itself. One point of knowledge to be gained in such works as those of Messrs. R. & A. Main is that the trouble in altering the patterns, and the enormous expense and work entailed in making the slightest change, are made evident; so that the men who are often asked by customers for trifling differences in such apparatus are better able to point out how impossible it is to comply with the request without very great expense. The magnificent cooking apparatus which the firm have had *carte blanche* to manufacture for a South American palace is a good example of the added work such special designs entail. It is not often that, in these modern days, such orders are placed. It took some time to examine the various processes carried out on the four acres covered by the works; but the time occupied was well spent, as much that was new and interesting was to be seen. Nothing was hid, from the founding to the plating and enamelling.

There is one reflection, however, regarding these visits which obtrudes itself more and more as the Eastern Juniors go through various works, and that is the absence of the seniors, who seem to think that the placing of their names on the roll of honorary members does not entail any further duties. How often do they show by their presence that these visits are of value? When they do attend, it is an indication that the visit is worth while; and thus the junior learns that what is good enough for his superior is good enough for him. The honorary members of the Western Section do thus encourage their younger brethren, and, in consequence, their visits are always well attended. In this connection, Mr. Alex. Wilson has done much good work. In the present instance, the Eastern juniors have themselves shown a good example to their seniors in that they at least have realized the value of such a visit, and have attended it without the lead which they might have expected. Messrs. R. & A. Main extended their hospitality as well as their welcome to the works—providing an excellent tea and a motor char-à-banc to convey the Edinburgh contingent to and from Falkirk.

Gas matters have been kept well before the Glasgow Corporation during the last week, first, in regard to the proposed Provisional Order to alter the incidence of rates and charges for the lighting of streets and common stairs. Objections to this have been raised by the House Owners and House Factors Association. Complaints have been received from time to time that the lighting in the recently annexed areas is not efficient, and it is desired to obtain fuller control of the whole lighting of private streets, courts, and common stairs, and also to levy the assessment for lighting purposes half on the owner and half on the occupier, instead of the whole on the occupier, as at present. These clauses are not proposed to come into operation until 1922. It seems that the lighting of the city of Glasgow is being done under an Act which was passed as far back as 1866. One of the councillors declared, in moving an amendment, that this clause be omitted from the Order, that it was only a "vote catcher," and put there for the purpose of gaining popularity with the voters; and in view of the two former occasions, when similar clauses had been inserted in an Order and had been allowed to drop, he begged the Corporation not to risk such another snub at Westminster. The Corporation, however, approved of the clauses by a large majority.

The plumbers and ironmongers of Glasgow have been following the lead of those in Edinburgh. A joint deputation from the Glasgow and West of Scotland Master Plumbers' Association and the Glasgow and West of Scotland Ironmongers' and Allied Trades Association was introduced to the Corporation by Mr. Renfrew, so that they could state their views regarding a proposed scheme of the Gas Department to hire-out high and low pressure lamps for outside shops and warehouses. The representative of the Ironmongers' Association, Mr. R. W. Chalmers, said that, owing to the policy of the Gas Department in the past, they had now lost their trade in gas-fires, cookers, and other appliances. It would have been much more correct to say that it was owing to the inanition of the ironmongers themselves, who failed to grasp the immense possibility of the gas cooker and stove business, and had consequently forced the Gas Committee to take the matter into their own hands. Before the Committee engaged in the sale and fixing of cookers and stoves, how many of these useful pieces of apparatus had been fixed by the plumbers and ironmongers, as compared with the number put into use through the efforts of the Gas Committee's servants? There is no doubt that the time has now come when an entirely different trade must be formed—viz., that of a gas-fitter as apart from the plumber; and while the gas-fitter will require to know a certain portion of the plumber's work, he need not trouble himself with the water-supplying and sanitary work. If the gas-fitter tries to master this portion of the work thoroughly, he will have quite enough to do when young to learn the many technical and practical points, and when older to keep his knowledge up-to-date. On the other hand, the plumber will be able to give his time to the study of the other portions of the work, and so make himself more efficient in his own branch.

The Musselburgh Gaslight Company have asked the Town Council to feu to them a piece of the town land for the extension of the works and the erection of a gasholder. The fact that this land is very close to the Golf Links and Race Course has caused some discussion locally. The Council therefore, on the recommendation of the Provost and Law Committee, have agreed to the principle of the concession, and have remitted the matter to a Committee to adjust the area and the rate of feu provisionally.

Another case of a stoker absenting himself from duty has been heard in Ayrshire, when the man was ordered to pay a fine of 20s., or suffer seven days' imprisonment, for contravening the Conspiracy and Protection of Property Act—having absented himself from duty for several days in September without notice to his employers. The Fiscal stated that persons employed in the supply of gas or water had not the freedom of breaking their contract at will, and that this provision was for the protection of the safety of the public.

The Middle Ward District Committee of the Council of Lanark have been extending the lighting of the main highway between Westburn Rows and Newton Rows by erecting 50 incandescent gas-lamps thereon. This lighting has also been extended throughout the Newton Rows. These districts are a part of Cambuslang parish, and indicate, therefore, the desire of the Middle District Ward to improve the gas supply which has already been evidenced in their determination to apply for a Provisional Order enabling them to adopt the Burghs Gas Supply Act and to amend this, where necessary, to make it suitable for a County Council.

The lamplighters of Dundee have put forward a claim for Sunday labour, pointing out that they do not have a Sunday off at all. Mr. Yuill thought the claim quite fair and reasonable, and suggested that the present rate of wages should be increased from 27s. 6d. to 28s. 9d. Mr. Yuill had laid before the men certain proposals to which they were quite agreeable. The Gas Committee have now had this matter under consideration, and have agreed to grant the increase in wages, which represents in all a sum of £489 9s. greater expenditure. The Dundee lamplighters are now probably the best paid of any men in Scotland doing the same class of work.

Mr. Ralph Halkett, the Superintendent of the Distribution and Sales Department of the Glasgow Corporation, delivered a lecture under the auspices of the Educational Committee of the Scottish Co-operative Society. Mr. Halkett referred to gas as an agent of hygiene in city life as regards comfort, regularity and punctuality of meals, the provision of well-cooked foods in the home, and, further, warmth and convenience in business. He dealt with the progress of gas as an agent for light, its economy and efficiency, and gave practical demonstrations. Gas was shown as a ventilating agent in both lighting and heating. The strides made in the structure of gas-fires, and the improvement gained in the modern method of radiant heating over the old method of convected heating, were explained, and costs given of the consumption per hour. The gas circulator, as a means of heating water by gas, was described, with its economy, efficiency, and adaptability, and the running cost per hour. The gas-cooker was stated to be an indispensable asset to the kitchen; and its advantages for the newer methods of cooking were detailed. The substitution of the gas-boiler for the brick-built boiler for washing purposes showed a difference in cost of consumption per hour. Finally, the lecturer explained the use of gas-irons for laundry work. The lecture, which was very interesting, was fully illustrated by lantern slides.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia. LIVERPOOL, *Dec.* 13.

There has not been any new development in the situation of this article during the past week, the market having continued of a desultory character and values having remained practically unchanged. Buyers have not shown much disposition to operate on an extensive scale, but, on the other hand, there has not been any great pressure to sell. Quotations are repeated at £12 16s. 3d. per ton f.o.b. Hull, £12 17s. 6d. per ton f.o.b. Liverpool, and £13 per ton f.o.b. Leith. The forward position also seems to be idle, in sympathy with near delivery, and no first-hand transactions have been reported.

Nitrate of Soda.

This market is without alteration, and the spot values are still 10s. 6d. and 10s. 9d. per cwt. for ordinary and refined quality respectively.

Tar Products. LONDON, *Dec.* 15.

The markets for tar products have remained fairly steady during the past week, though a further slight fall in pitch has been seen. A fair amount of business has been transacted in this article; and the majority of orders have been taken at slightly lower prices. There appears to be more offering for delivery over the next month or two. Benzols maintain their price, though business is somewhat quiet. In naphthas, there is very little business doing. There has been a slight advance in the value of crude carbolic during the past week, and a few transactions have been recorded at the increased prices. It is reported that as much as 1s. 1½d. has been paid for the 60's quality. Creosote remains firm, and the inquiry is good for both near and forward delivery.

The average values during the week were: Tar, 27s. 6d. to 31s. 6d. Pitch, London, 40s. to 40s. 6d.; east coast, 39s. to 40s.; west coast, Manchester, 39s. to 40s.; Liverpool, 39s. 6d. to 40s. 6d.; Clyde, 39s. to 40s. Benzol, 90 per cent., naked, London, 1s. 1d. to 1s. 1½d.; North, 11½d. to 1s.; 50-90 per cent., naked, London, 1s.; North, 11d. Toluol, naked, London, 10½d. to 11d.; North, 10⅜d. to 11d. Crude naphtha, in bulk, London, 5½d. to 5⅝d.; North, 5d. to 5¼d. Solvent naphtha, naked, London, 10¼d. to 10⅜d.; North, 9¼d. to 9⅜d. f.o.b. Heavy naphtha, naked, London, 10d. to 10⅛d. f.o.b.; North, 9d. to 9⅛d. f.o.b. Creosote, in bulk, London, 3⅛d. to 3⅜d.; North, 3d. to 3⅛d. Heavy oils, in bulk, London, 3⅜d. to 3⅝d. Carbolic acid, casks included, 60 per cent., prompt, east and west coasts, 1s. 1d. to 1s. 1⅛d. Naphthalene, £4 10s. to £10; salts, 55s. to 60s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit; "B" quality, nominally ⅝d. per unit, packages included and delivered.

The figures given in last week's issue for crude naphtha (London and North) were incorrect. They should have been: London, 5¼d. to 5½d.; North, 5d. to 5¼d.

Sulphate of Ammonia.

The market has again been very dull throughout the past week, and orders have been taken abroad for the forward position at the equivalent of to-day's quotations, though the majority of manufacturers ask a premium for the forward position. Outside London makes are quoted at £12 2s. 6d.; Hull, £12 16s. 3d. to £12 17s. 6d.; Liverpool, £12 17s. 6d. to £12 18s. 9d.; Leith, £12 18s. 9d. to £13; Middlesbrough, £12 17s. 6d. to £12 18s. 9d.

"**Tar Distiller**" writes under date of the 12th inst.: Tar products are having a battle between those who wish for low prices and others who are desirous that the present prices should be maintained. It is useless for anyone to deny that the production all round and the visible supply are not above the requirements of the trade, in nearly all articles. Creosote and benzol are in good demand at the present prices, and to maintain this demand it only requires makers to be satisfied when they have a good figure for these products. Practically all the makers of pitch are firm with a very small unit of dissension, and when this unit has exhausted itself we shall see the return of good prices.

COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade in the north-east is steady, except as far as a delay of ready tonnage influenced the shipments. For forward shipment prices are easier for some kinds of fuel. Steam coals are quiet. Best Northumbrians are from 14s. 10d. to 15s. per ton f.o.b.; second-class steams are 13s. per ton; while steam smalls are plentiful, and may be quoted from 6s. 3d. to 8s. 6d. per ton f.o.b. The end of the Baltic season makes coal rather more ample in the supply offering for after the holidays. In the gas coal trade, there is a strong demand, and for early delivery there is some scarcity. Best Durham gas coals are about 15s. 6d. per ton f.o.b.; second-class qualities are from 13s. to 14s.; and "Wear specials" are 15s. 6d. to 16s. There are inquiries in the market for part of next year's supply of gas coal for Trieste; the larger part of the needs being left over for the present. This is a method which appears to be increasingly adopted; and it evidently points to the fact that there is an expectation of lower prices after the heaviest of the winter demand for gas coal has been met. Other classes of Durham coal are being sold for next year at reduced prices. Coke is firm and scarce. Gas coke is in exceptionally plentiful supply just now; and good makes are from 16s. 3d. to 17s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The firmness of the tone in all departments of the Scottish coal trade is being maintained, and all the collieries have full orders right

up to the holidays. On the Glasgow Coal Exchange, on Friday, the following were the approximate prices quoted: Ell coal, best brands, 13s. 9d. to 14s.; splint, 13s. 9d. to 17s.; Hartleys, 16s. 6d.; Navigations, 15s. to 16s. 9d.; steams, 13s. to 14s. 6d.; trebles, 13s.; doubles, 12s. 3d. to 12s. 6d.; singles, 10s. 9d. to 11s.; pearls, 9s. 3d. to 9s. 9d.; dross, 7s. to 7s. 6d.—f.o.b. Glasgow.

Gas Apparatus Show-Rooms "Necessary Adjuncts."

The new gas-apparatus show-rooms of the Rochdale Corporation were opened to the public on Friday. Mr. Walker, the Chairman of the Gas Committee, said the earlier examples of the more enterprizing undertakings in establishing show-rooms and organizing a staff of competent employees to instruct their consumers in the use of apparatus best suited to each particular requirement had proved so successful, that such establishments were now looked upon as necessary adjuncts to any progressive undertaking. Gas-fires would, in future, be supplied on the hire-purchase system, at rates to include the cost of fixing; and cookers would be fitted free of cost, provided the position was within reasonable distance of the supply-pipe. Cooker hiring rates would, however, remain the same. Mr. T. B. Ball, the Gas Engineer, said he hoped the Council would not look on the show-room as a profit-earning department, but as an educational centre. Indirectly, of course, there would be profit by the increased use of gas. Wherever show-rooms had been opened, the result had been more consumption.

Gas Accounts at Pontefract.

Last Wednesday, at the Pontefract County Court, his Honour Judge Benson had before him a series of actions brought by the Corporation against ratepayers to recover amounts shown by the gas-rental books to be in arrear for the half year ended June 30, 1909 The first defendant, Tom Ward, until recently licensee of the Mail Coach Inn, produced receipts for all gas bills since 1909, none of which contained a note of any arrears; and he said the older receipts were lost when he removed from the inn. Mr. Arthur Gibson, the late Accountant to the Corporation, stated that the amount had never been paid; and he produced the books formerly kept by him to show that it had been carried forward each succeeding half year. The reason it had not been entered on the subsequent demands was because of the short staff. It had been omitted inadvertently. In giving judgment, his Honour said the only evidence against defendant was a record in the Corporation books. The case was on all-fours with one he decided at a recent court. In face of the admission that the books had sometimes been found inaccurate, and of defendant's positive assertion that he had always paid his rates regularly in one sum, he could not possibly hold that the amount was still outstanding, and therefore gave judgment for defendant, with costs. Other cases were before the Court; and it was stated that the whole of the arrears discovered during the present investigations have now been dealt with.

Electric Light Failures.

Owing to a breakdown of the electric light, Monmouth was in darkness on Nov. 30. As there was no moon, the position of the residents may be easily imagined. Some tradesmen lit the gas in their shops, and this was much appreciated by pedestrians. It was a curious sight to see people going about with lanterns. The cause of the failure was, according to a statement made by Alderman Honeyfield at the meeting of the Town Council the following Tuesday, a quantity of moisture in the cables, which interfered with the current. It appears that the cables generally are in a bad condition. Owing to the failure of the electric light, many shops and private houses in several parts of Surrey were plunged into darkness last Tuesday night. The places affected included Merton, part of Mitcham, Purley, Kenley, Coulsdon, and Wallington. The light failed about five o'clock, and up to a late hour it had not been restored. In the majority of cases the streets were lighted by gas. Shortly before nine o'clock last Wednesday evening, the electric light failed in the Picturedrome, Curzon Street, Burton-on-Trent, and as a result the audience had to wait for about an hour before the programme could be continued. It appears that the failure was caused by a switch breaking down on a consumer's premises on the Shobnall Road; and the residents in that portion of the borough who use electricity had their houses plunged into darkness, while the street-lamps were also extinguished. The inconvenience was confined to the two thoroughfares mentioned. The churches of Oswestry were thrown into darkness on the evening of last Sunday week, by reason of a cable fusing at the electric light works. Service had begun when the light suddenly failed, and the gas supply had to be resorted to where the electric light is not relied upon solely for purposes of illumination. At the Parish Church, where electricity is used as the motive power for blowing the organ, it became necessary to requisition a pianoforte to take the place of the organ, while candles had to be resorted to in order to light up the choir stalls. Owing to the failure of the electric light, the Birkby district of Huddersfield was to a large extent in darkness for more than half-an-hour last Friday night. The failure, which occurred about 8.15, was due to the blowing of the fuse in a transformer box. The congregation which assembled at the opening of a parish hall in connection with the new parish of St. Cuthbert's listened in almost total darkness to an address by the Bishop of Wakefield, and the service was concluded in candlelight.

New Rand Water Supply.—The Rand Water Board have approved a scheme for securing an additional supply of water from the Vaal River. The work will take four years to complete, and is estimated to cost about £1,300,000. It is proposed to pump the water from the river in the vicinity of Vereeniging to the existing pumping-station of the Board at Zwartkopjes, and from this point to pass it through pipes to balancing tanks and reservoirs already in use at the distributing centres.

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The New Vertical Retorts at Southport.—At the last meeting of the Southport Gas Committee, it was reported that the installation of Glover-West vertical retorts, the inauguration of which was recorded in the "JOURNAL" for the 4th ult., was working successfully and satisfactorily. It was stated that already a great saving had been effected in the production of gas.

Concessions to Gaslight and Coke Company's Co-Partners.—The "Co-Partners' Magazine" of the Gaslight and Coke Company contains an announcement that the Directors have decided to grant, subject to regulations to be hereafter framed, the following privileges as regards the supply of gas and coke: To co-partners who are householders consuming the Company's gas, a discount at the rate of 3d. per 1000 cubic feet; to those burning coke, a supply at the current yard price, delivered free within a reasonable area from the works.

Buenos Ayres Water-Works Company, Limited.—The fourteenth ordinary meeting of this Company was held the week before last—Mr. J. C. im Thurn (the Chairman) presiding. In moving the adoption of the report, already noticed [*ante*, p. 767], the Chairman said he thought that the shareholders might congratulate themselves that the Company had justified its existence. The policy of beginning with a moderate area, and carrying out the works in a prompt and conciliatory manner has won for it the confidence and support of the inhabitants, and ensured the granting of the extension concession, with the full support of the inhabitants of the districts to be served. The Company had thus established itself upon a firm footing, and acquired the important status of the water-supply undertaking of the growing and opulent residential districts of the great city of Buenos Ayres. The report was unanimously adopted. It was subsequently resolved to increase the capital of the Company to £1,000,000.

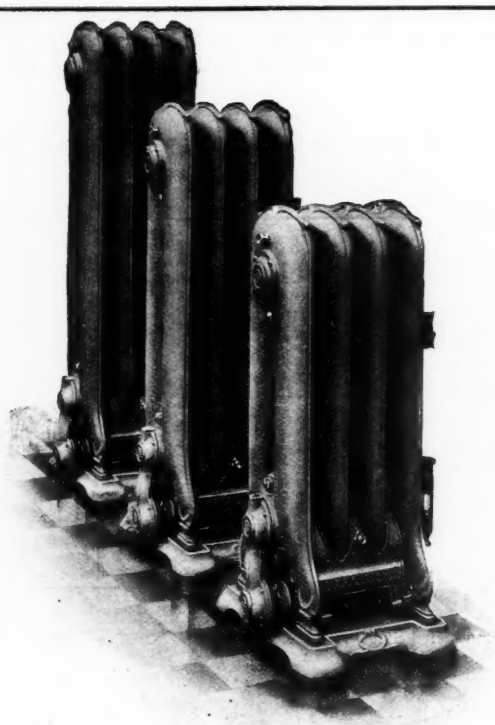
The Poor Lighting of Parliament Square.—Attention was recently called in the "Sanitary Record" to the inferior gas lighting of Parliament Square by the Office of Works, as compared with that of Whitehall. A correspondent signing himself "Progress" offered the following remarks on the subject in a letter which appeared last Friday: "It is with pleasure that I notice that you have taken up this matter, for the lighting at present provided by H.M. Office of Works is a disgrace to any public body. But you fall into error when you suggest that the Office of Works officials are not aware of modern developments in lighting. A few of the globe lamps around the Houses of Parliament were replaced about a year ago by others fitted with inverted gas-burners, which effected a great improvement in the lighting of the portions so treated. One can only suppose that the improvement was so great that the official mind could not grasp it—that it was too great a stride to be dignified. Whatever the cause, the fact remains that, with the improved lamps and the fine example of the City of Westminster before them, the Office of Works have not seen fit to make any improvement in the public lighting under their control. Apparently the economy and improved illumination obtainable from inverted gas-burners do not trouble the official mind."

Power Gas Corporation.—For the year to the 30th of September, the accounts of the Corporation show a total profit of £16,019, to which has been added £3131 brought forward, making £19,150, which the Directors propose to apply as follows: To the reserve fund, £3120; to dividend at 5 per cent. per annum upon the ordinary shares, less income-tax, £12,481; leaving a balance of £3549 to carry forward.

Colwyn Bay Gas Undertaking.—In his annual report, just submitted, the Gas Engineer and Manager of the Colwyn Bay Urban District Council (Mr. J. Smith) states that during the past year the expenditure was £15,792, and that after meeting it a profit of £1939 was realized. He suggests that a concession should be made to consumers, as this would tend to the increased use of gas, by which the capital charges would be spread over a larger area. He also advocates the extension of the profit-sharing scheme among the employees (with the exception of the Engineer), as this system has, he says, proved beneficial in other concerns.

Liverpool Water Supply.—In connection with the Vyrnwy water scheme, the Lord Mayor of Liverpool (Mr. H. R. Rathbone) recently declared open a new balancing reservoir at Malpas, in Cheshire. The object of the reservoir is not only to secure the necessary hydraulic gradient for the working of the aqueduct, so as to break the pressure from point to point, but it also serves the purpose of recharging the mains after a burst, and provides a certain amount of reserve storage. Its capacity is 4½ million gallons. After the Lord Mayor had turned the water into the reservoir, he was presented by Lieutenant-Colonel Porter, on behalf of the Water Committee, with a silver-mounted cut crystal water jug and two glasses.

No Electric Light Scheme for Teignmouth.—The question of providing an electric lighting scheme for the town was discussed by the Teignmouth District Council on Tuesday last. A return was presented by the Clerk, showing the position of such undertakings in other places. Mr. Turpin pointed out that eleven out of eighteen of the works included in the return were run at a loss, and of those which made a profit three derived revenue from the tramways. Mr. J. A. Gray, the Gas Engineer and Manager, remarked that the revenue of an electricity undertaking at Teignmouth would be derived from the financial depreciation of the gas undertaking, and in the event of a deficit would impose greater burdens on the ratepayers. For many years it would certainly be non-supporting and a burden on the rates. If a company secured the rights of supply, the obligation to provide the capital would be avoided by the Council, and the gas undertaking would have the advantage of retaining the undivided attention of the members in meeting competition. As a whole, electricity undertakings were less financially stable than gas-works. Mr. Full said that Shaldon was entitled to better lighting; and he moved that electric lighting should be provided for that part of the district. This motion was defeated by seven votes to three. It was then decided by a similar majority that the Council should not themselves further entertain the question of the provision of an electrical installation for the urban district or any part of it.



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Ownership of the Tuam Gas-Works.—It is announced that Mr. W. E. Barnett, Secretary and Manager of the Westport Gas Company, has purchased the gas-works at Tuam from Mr. James M'Donnell, who is retiring.

Gas Profits at Loughborough.—It has been stated by the Chairman of the Loughborough Gas Committee (Mr. Chorley) that there is a profit of over £3000 for the past half year; this amount being slightly below the figure for the corresponding period of the previous year. As accounting for this, he pointed to the increased cost of coal, and the reduction of 2d. per 1000 cubic feet in the price of gas.

Iron v. Steel Water Pipes.—The Sleaford Rural District Council recently decided to use cast-iron pipes in preference to steel tubes, for two new water schemes at Heckington and South Kyme, because the Local Government Board would grant a loan for only fifteen years for the latter, but for thirty years for the former. It was stated that steel tubes would have been preferred if the Board had offered the longer term in both cases.

Bahia Blanca Water Supply.—At the annual meeting of the Bahia Blanca Water-Works Company on Wednesday week, Mr. T. P. Gaskell, who presided, said the Company were asking the Provincial Government of Buenos Aires to consent to the construction of another reservoir to hold 6 million gallons of water. This additional storage would be a great help, for the amount of water the Company supplied in the dry season was very nearly up to their capacity. At the same time they were applying to the Government to allow them to take double their present quantity of water. The Company's capital reserves were nearly exhausted; and during the current year they would have to look to the two Railway Companies to supply an additional amount of capital to enable them to construct the new reservoir and carry out other works required.

Public Lighting at Torpoint.—The Torpoint District Council at their last meeting decided to accept the tender of a proposed Electric Light Company for the lighting of the town with 75-candle lamps at £2 14s. each per annum. The Gas Company had offered to undertake the lighting with lamps of similar power for £2 10s. each. The proposal was much criticized at the Council meeting, on the ground of the extra cost it would involve; and various amendments were moved with the object of defeating or delaying it. A majority, however, decided to give the Electric Light Company the contract for five years. A public meeting of ratepayers was held last Wednesday to consider the Council's action. Mr. G. Warde, who presided, said they were not justified in incurring extra expense when they already had good lighting, and things were being conducted as satisfactorily as possible. In the course of the discussion, Mr. Wiltshire, a member of the Council, said he did not believe they could or would go back on their decision. He had voted for gas purely on a business basis, because they were getting a light quite as good as electricity and at a cheaper rate. Mr. Sleeman, another member, said he was opposed to the ratepayers' money being wasted on a fad. A resolution in opposition to the Council's action was carried by an overwhelming majority.

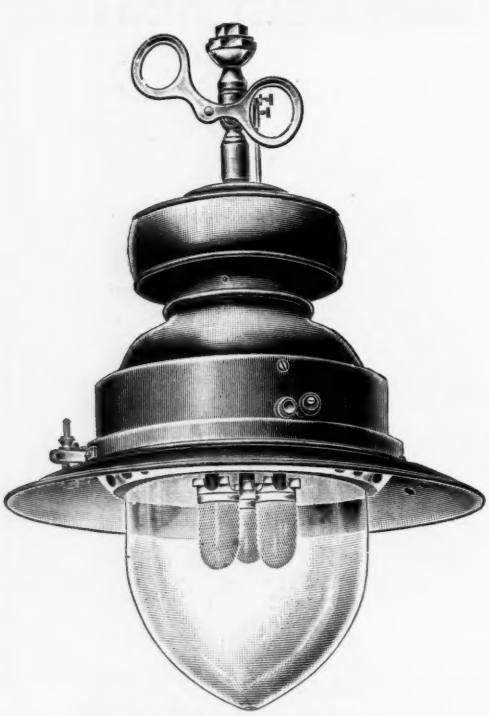
Rewards for Bravery.—The King has been graciously pleased to award the Edward Medal of the Second Class to Herbert Briggs, Christopher Bywater, and Thomas Vinters, who showed great bravery in trying to save three others who were overcome by gas in a large gasholder at Lower Wortley, Leeds, on the 12th of August. While unsuccessful in two cases, they effected the rescue of the third.

London County Council and the Testing of High-Pressure Gas-Meters.—The report of the Parliamentary Committee of the London County Council which was presented at the meeting of the Council last Tuesday contained a paragraph setting forth the steps the Committee have taken with the view of obtaining legislation on the subject of the testing of high-pressure gas-meters [see *ante*, p. 756]; and their action was approved.

Tees Valley Water Board and Large Consumers.—According to the "Yorkshire Post," an agreement which will have a very important effect upon the finances of the Tees Valley Water Board, and also on those of the three constituent authorities—the Middlesbrough, Stockton, and Thornaby Corporations—has just been concluded between the Finance Committee of the Water Board and the large consumers of water. Under an existing agreement, these consumers are entitled next year to a reduction of ½d. per 1000 gallons in the charge for water, which represents a substantial loss of revenue; and in view of the fact that the water undertaking has proved a heavy burden upon the rates of the three boroughs, suggestions were made to the large consumers that they might forego their right to the reduced charges. They have now adopted a resolution, in which they state that they are prepared to continue the extra payment under the "large consumers' clause" for five years to date from Dec. 31, 1914, when the arrangement shall be reconsidered. This suggestion is to be embodied in a clause to be settled between the legal representatives of the Board and those of the large consumers.

Epsom Water Supply.—At the meeting of the Epsom Urban District Council last Tuesday, an exhaustive report was received from the Water Committee respecting the proposed developments in connection with the town's water service. The Committee, acting on the reports of their Consulting Engineer (Mr. W. Vaux Graham, M.Inst.C.E.), recommended: (1) That the Consulting Engineer prepare specifications for the erection of a water-tower at the high-level reservoir, and that application be made to the Local Government Board for sanction to a loan of £4545 for the work; (2) that application be made to the Local Government Board for sanction to borrow £1355 for the purchase and fencing of about two acres of land adjoining the existing high-level reservoir for the purpose of making a new reservoir; (3) that Messrs. J. Simpson and Co.'s tender of £2303 for the erection of the new surface and well pumps be provisionally accepted; and (4) that Messrs. Sophus Berendsen's tender at £5 14s. 6d. per ton for 15 inch pipes and £11 per ton for specials for the new main be provisionally accepted. The Chairman of the Committee (Mr. Langlands) moved the adoption of the first recommendation; but it was decided to refer it and the others back for further consideration.

MAINTENANCE PROBLEM SOLVED.



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Parabolic Reflectors, extra	9/6	12/-	12/-	12/-	each.

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Llandilo Gas Company's Affairs.

An application was made some days ago to Judge Lloyd Morgan, at the Carmarthen County Court, for an order for the winding-up of the Llandilo Gas Company, and for the appointment of the Official Receiver as Liquidator. Mr. White, in making the application, explained that the petitioner was Elizabeth Williams, and the Company were indebted to her in the sum of £535 12s. 6d., being money lent, and interest. In a petition, she said she had applied to the Company for payment of the debt; but the Company were unable to comply. Mr. Bishop, who appeared for the Company, stated that, though he consented to the application, he did not wish it to be understood that the Company admitted the validity of the bond for the £500. His Honour granted the order, and appointed the Official Receiver as Liquidator.

New Joint-Stock Companies.—The Flash Controller Company, Limited, has been registered with a capital of £750, in £1 shares, to carry on business as manufacturers of, and dealers in, gas cocks and valves. Tarmac is the title of a company formed with a capital of £200,000, in £1 shares, to take over the business carried on at Ettingsall, near Wolverhampton, by a Company of the same name, which was incorporated in 1903, as Tar Macadam (Purnell Hooley's Patent) Syndicate, Limited, and renamed in 1905. Power Gas Economy, Limited, has been registered with a capital of £10,000, in £1 shares.

Lighting of Dublin Tenements.—In connection with the housing problem which has become so acute in Dublin, the Corporation have passed a resolution to the effect that "powers ought to be given to the Local Authority to insist that all halls, passages, and stairs of tenement houses be adequately lighted at night." Alderman Walter, who moved the resolution, said provision was made in the matter in the last General Powers Bill promoted by the Corporation; but the proposal did not meet with the assent of the citizens. There was now, however, an opportunity, under the Local Government Board inquiry into the condition of housing in Dublin, of having this important factor in regard to decent tenements looked after, and a much needed remedy applied. He expressed the hope that the Inspectors might be induced to make a recommendation for this extension of the lighting system.

Central Offices for the Metropolitan Water Board.—At the meeting of the Metropolitan Water Board last Friday, it was decided to appropriate the land belonging to them in Rosebery Avenue as a site for their central offices. The General Purposes Committee were instructed to report on the steps to be taken for this object, and to select six architects to prepare competing plans, and to arrange, if practicable, to incorporate in the new buildings the Oak Room and the adjoining room at present in the offices at Rosebery Avenue. The Committee were also authorized to appoint a professional assessor to advise on the conditions of the competition and on the designs for the buildings, which are not to cost more than £80,000. The whole site on which the buildings are to be erected includes the Round Pond and three filter-beds, and has an area of about 7¾ acres.

Fire Caused by a Defective Electric Circuit.—There was an outbreak of fire on Saturday evening at No. 95, New Bond Street, W.—premises occupied by a firm of publishers and other tenants. The cause was a defective electric circuit.

We have received from the Wholesale Fittings Company, Limited, their price list No. 62, which is now being issued to the trade. It comprises an extensive assortment of art brackets and pendants (inverted and otherwise), together with stoves and arc and other lamps for both oil and gas. There are about 130 pages of descriptive matter.

The Maidstone Gas Company are determined to secure the maximum amount of public interest in their show-room in the High Street. During the recent "shopping week," one of the windows was devoted to the representation of a well-appointed dining-room, showing the latest appliances for gas lighting, heating, &c.; and this has since been succeeded in turn by a drawing-room and a bedroom similarly arranged. These will be followed in due course by a kitchen.

The North British Railway Company have recently adopted high-pressure gas lighting for their extensive goods yards at Leith and Portobello, near Edinburgh. The compressors and lamps were supplied and fixed by the Invicta Gas Lighting Company, of Kingsway House, E.C., and the main and service laying was carried out by Messrs. A. H. Ball and Co., Limited, of Farnham. The lighting of the outside lamps (numbering about eighty, of 1500 and 1000 candle power), and the smaller lamps in goods-sheds, &c., is controlled from the compressor house. The outside lamps are carried on light steel columns; and means are provided for lowering them for cleaning.

The Welsbach Light Company, Limited, have sent us the excellent collection of advertising literature and material which they have prepared for the use of those who now sell their goods, and are desirous of increasing their business in this line. There are four very effective show-cards—viz., the "Sunlight" mantle; the well-known Welsbach poster, reproduced as a card, showing a collector and an inspector emptying the cash-box of a prepayment meter; the "Kern" gas-radiator; and the Welsbach burners. Two other cards show the "Aur" upright and inverted mantles. The collection comprises, in addition to a number of leaflets and two large coloured posters, two booklets, entitled "The Tale of a Little Lost Dog" and "Do You Want a Light?" Another contains reproductions of the Company's advertisements now appearing in the daily, weekly, and monthly Press. The entire collection, which is supplied free, bears evidence of much skill in the preparation of advertising matter; and, judiciously used by those for whom it is intended, it should result in a considerable extension of the Company's business. The Company have just brought out a new edition, in a compact form, of their Kern radiator catalogue, which contains the new season's models, in addition to some interesting information concerning these radiators. They have also issued some new leaflets dealing with their indoor and outdoor lamps.

THE

Ventilating Radiator.

Richmond's Ventilating Gas-Steam Radiators should be fitted in all Workshops, Factories and other places coming directly under the jurisdiction of the Home Office. It conveys products through the flue to the outside atmosphere. Where the ordinary flueless radiator cannot be fixed we recommend this system.

When considering the next installation for Factories, Workshops, &c., write us.

Full particulars and lists on application.

THE RICHMOND GAS STOVE AND METER COMPANY LIMITED

132, Queen Victoria Street, London, E.C.

Works: Warrington, England.

At the Demonstration Hall of the Northampton Gas Company, on Monday last week, Mr. W. P. Hannen offered for sale £25,000 of 5 per cent. stock of the Company, in £100 lots. The biddings ranged from £105 15s. down to £100 5s.; and the total amount realized by the sale was £25,802 10s., being an average of rather more than £103 4s. per lot.

According to a published account of the sinking of submarine C14 in Plymouth Sound last week—an accident which happily was unattended by loss of life, in spite of the fact that the submarine foundered ten minutes after collision—the troubles of those on board were increased by the fusing of a wire, which filled the interior of the craft with flames.

After ten years' boring, at a cost of £10,000, a water supply has been found for the little town of Upton-on-Severn. All the money required cannot be borrowed, and so much has to be paid from revenue that a special rate of at least 3s. 1d. in the pound will be needed for the coming year. The balance, which may be borrowed, will involve an added rate of 3d. for thirty years.

The Cradley Heath Gas Company have placed an order with Drakes Limited for the erection of a coal-handling plant, consisting of coal breaker, elevator, two push-plate conveyors, and hot-coke conveyor, with the necessary gearing and electric motors, coal-hoppers, and generating plant in duplicate; also for one of their patent combined charging and discharging machines. The whole of the work has to be carried out under the supervision of Mr. Charles Dakin, the Company's Manager and Secretary.

A Local Government Board inquiry was opened last week by Mr. A. W. Brightmore with regard to an application by the Winchcombe Rural District Council to borrow £17,100 for providing water for six parishes or parts of parishes. It was stated that the proposal was to take the water from a spring at Lidcombe Wood yielding nearly 450,000 gallons a day—Evesham to have 250,000 gallons and Winchcombe 100,000 gallons, at 1½d. per 1000 gallons. Other suggestions were brought forward in the course of the proceedings; and the Inspector said he must visit the springs spoken of, for which purpose he adjourned the inquiry.

The annual dinner in connection with the West Greenwich Gas-Works Institute was held at the Institute on Saturday, and proved a complete success. The President (Mr. J. F. Braidwood) was in the chair, supported by Messrs. A. Showell and W. King. Among those present were Mr. W. Doig Gibb (Chief Engineer), Mr. F. M'Leod (Secretary), Messrs. J. Waterer and J. Newbold (Employee Directors), and Mr. P. Richbell (Chief Cashier). The toast of the "South Metropolitan Gas Company" was proposed by the Chairman, and responded to by Mr. Newbold. The health of the Chairman was proposed by Mr. Richbell. During the evening the cricket prizes were presented by Mr. Doig Gibb, and a vote of thanks to the Committee was proposed by Mr. M'Leod. An excellent concert was provided.

APPLICATIONS FOR LETTERS PATENT.

27,701.—KERSHAW, C., and A. KERSHAW AND SON, LTD., "Bunsen burners." Dec. 2.

27,790.—THOMPSON, W. P., "Gas-lamps." A communication from A. H. Humphrey. Dec. 3.

27,793.—EVERED AND CO., LTD., and BOXALL, J. E., "Gas lamps or fittings." Dec. 3.

27,820.—GLOVER, S., and WEST, J., "Manufacture of gas." Dec. 3.

27,869.—BOECKEM, F. W. O., "Air-carburetting apparatus." Dec. 3.

27,880.—BATTISCOMBE, C. A., "Utilization of heat wasted in raising and maintaining the required temperature in cooking-ovens." Dec. 4.

27,888.—SAHLIN, A., "Gas-producers." Dec. 4.

27,903.—GRAHAM, J. & A., "Pressure-reducing valves." Dec. 4.

27,922.—LYMN, A. H., "Producer gas and power installations." Dec. 4.

27,937.—SCOTT, J., "Prepayment meters." Dec. 4.

27,952.—FAIRBROTHER, H., "Regulating the pressure of gas." A communication from R. Bury. Dec. 4.

27,955.—WELSBACH LIGHT COMPANY, LTD., "Bunsen burner apparatus." A communication from the Deutsche Gasglühlicht Akt.-Ges. (Auer Ges.). Dec. 4.

27,956.—WELSBACH LIGHT COMPANY, LTD., "Gas-heated flat-irons." A communication from the Deutsche Gasglühlicht Akt.-Ges. (Auer Ges.). Dec. 4.

27,957.—WELSBACH LIGHT COMPANY, LTD., "Regulating means for burners fed with compressed air and with gas." A communication from the Deutsche Gasglühlicht Akt.-Ges. (Auer Ges.). Dec. 4.

27,962.—JOHNSON, J. Y., "Manufacture of ammonium sulphate." A communication from the Badische Anilin und Soda Fabrik. Dec. 4.

28,038.—TREEN, J. C., "Prepayment meters." Dec. 5.

28,047.—SAWYER, R., and PINTSCH'S PATENT LIGHTING COMPANY, LTD, "Railway gas lighting." Dec. 5.

28,049.—SIEMENS, F. K., "Regenerative furnace." Dec. 5.

28,055.—GLOVER, S., and WEST, J., "Discharging vertical retorts." Dec. 5.

28,072.—FRANKE, T., "A new fuel." Dec. 5.

28,093.—WILLIAMS, A. J., "Metallic packing for gas, water, &c." Dec 6.

28,117.—DEMPSTER, R., AND SONS, LTD, and MITTON, W., "Conveying and discharging coal, coke, and the like." Dec. 6.

28,118.—DEMPSTER, R., AND SONS, LTD., and MITTON, W., "Filling skips, &c." Dec. 6.

28,123.—MACLAURIN, R., "Utilizing energy of furnace gases." Dec. 6.

CLARK'S Patent Flueless Stoves

(SYPHON PRINCIPLE)

Outstanding Advantages:—

Perfectly Hygienic.
No flue required.
Gives a cosy light as well as an economical warmth.
Pleasing in design and of excellent finish.
Can be fixed in any position.

The PHŒNIX.

PROMPT DELIVERY. TERMS AND LISTS BY RETURN.

CLARK'S SYPHON STOVE CO., LD.

Originators and Inventors,

132, Queen Victoria Street, London, E.C.
Factory: Warrington, England.

GAS COMPANIES' STOCK AND SHARE LIST.

Business on the Stock Exchange last week was very quiet—showing unmistakable signs that Christmas is not far off. Despite the fact that most of the compelling influences were less hurtful—the French had found a Government, the money tightness was relaxing, and the "fiery crosses" of labour were less incendiary—nevertheless the general tendency of markets was decidedly dull and depressed. Consols, indeed, registered a fresh low-water mark, changing hands on Wednesday at 71 1/16. The opening on Monday was fairly promising in most lines. Government issues and other gilt-edged luxuries were not among these, and Consols fell 1/8. Rails were pleased, however, with the terms of the Great Western settlement, and made some advances; and Transatlantics were supported by foreign buyers. Tuesday was not so favourable, and Government issues of all sorts were in bad case. Consols fell another 1/8 for money and for the account. Rails were slack and undecided, and Transatlantics weakened. Wednesday was rather a miserable day. Except a few odds and ends which were moderately propped up, everything gave way. Consols made their new record. Rails were so neglected that they could not avoid a fall; and Transatlantics were put down by persistent sales abroad. Thursday was quite slack and uninteresting. Consols had a respite from attacks of weakness, but gathered no strength. Rails were still receiving the cold shoulder, and prices were lower, though not severely depressed. The general tendency on Friday was dullish. The gilt-edged market was put out by another imminent issue—the Port of London loan. Rails, though very quiet, were rather better, and some small advances were made. Foreign bourses sold Transatlantics. On Saturday, markets were apathetic and almost inanimate. The dullness was almost universal. Government issues weakened, and Consols lost 1/8 for the account. The closing price was 71 5/8 to 71 7/8—a fall of 1/4 in the week. Even in the Gas Market (for some reason or other which is not apparent) the lowest prices of the week were marked on this day. In the Money Market, there were some uncertain movements, but an easier tendency predominated. A reduction in the German Bank rate was an incident. Business in the Gas Market was much quieter. Several undertakings marked only one single transaction apiece; and the leading issue alone approached an average. Prices in general were not so good as last week—even gas enjoying no absolute immunity from the prevalent shrinkage of figures. In Gaslight and Coke issues, the ordinary was at its best on Monday with a mark of 103 1/4, from which it tailed to 102 at the close. In the secured issues, the maximum realized from 75 to 75 1/2, and the preference from 94 to 95. South Metropolitan seemed inclined to rise, with dealings at 109 1/2 to 111; and the debenture made 73. In Commercials, there were only two transactions in the 3 1/2 per cent. at 102 1/2 and 104. Among the Suburban and Provincial group, Brentford new changed hands at 206, Bournemouth preference at 13 1/2, Lea Bridge at 120, Tottenham "B" at 116 1/2 (with an odd lot at 115), and Wandsworth "B" at 130 1/2. In the Continental companies, Imperial marked 167 1/2 to 170 (a rise of 2), ditto debenture 84, and European 17 9/16 and 17 5/8. Among the undertakings of the remoter world, Cape Town preference fetched 2 3/8, Monte Video 12, Ottoman 7 3/4 to 8 5/16, Primitiva 5 7/8 to 6, and ditto preference 4 31/32 to 5 1/32.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.	£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 15	4	Alliance & Dublin Ord.	58—61	..	6 11 2	75,000	5	Dec. 11	6	Malta & Mediterranean	4 3/8—4 7/16*	.	6 3 1
374,000	,,	July 11	4	Do. 4 p.c. Deb.	80—83	..	4 16 5	250,000	100	Oct. 1	4 1/2	Met. of Melbourne 4 1/2 p.c. Deb.	97—99	..	4 10 11
280,000	5	Oct. 15	7 1/2	Bombay, Ltd. . . .	6—6 1/2	..	5 15 5								
50,000	10	Aug. 28	15	Bourne- 10 p.c. .	28 1/2—29 1/2	..	5 2 2	541,920	20	Nov. 27	4	Monte Video, Ltd. . .	11 3/8—12 1/4	..	6 10 8
347,500	10		7	mouth Gas B 7 p.c.	14 3/8—15 1/2	..	4 11 10	1,775,892	Stk.	July 30	4 1/2	Newc'tle&G'tesh'd Con.	98 1/2—99 1/2	—1/2	4 10 6
75,000	10	,,	6	and Water Pref. 6 p.c.	13 1/2—13 3/8	..	4 7 3	529,705	Stk.	June 27	3 1/2	Do. 3 1/2 p.c. Deb.	83 1/2—84 1/2	..	4 2 10
880,000	Stk.	Aug. 14	14	Brentford Consolidated	262—267	..	5 4 10	55,940	10	Aug. 28	7/10/6	North Middlesex 7 p.c.	12 1/2—13 1/2	..	5 11 5
830,000	,,	,,	11	Do. New . . .	203—203	..	5 5 9	800,000	Stk.	Nov. 27	8	Oriental, Ltd. . . .	125—125	..	6 8 0
50,000	,,	,,	5	Do. 5 p.c. Pref. .	111—113	..	4 8 6	60,000	5	Sept. 26	10	Ottoman, Ltd. . . .	7 3/8—8 1/8	—1/4	6 1 3
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb. .	91—93*	—1	4 6 0	60,000	50	Aug. 14	13	Portsea, Island B . .	127—130	..	5 0 0
217,380	Stk.	Aug. 28	11	Brighton & Hove Orig.	201—206	..	5 6 10	100,000	50	,,	12	Do. C . .	120—123	..	4 17 7
244,200	,,	,,	8	Do. A Ord. Stk. .	149—152	..	5 5 8	249,980	5	Oct. 15	8	Primitiva Ord. . . .	5 3/8—6 1/4	..	6 8 0
530,000	20	Sept. 26	12 1/2	British	44 1/2—45 1/2	..	5 9 11	499,960	5	June 27	5	,, 5 p.c. Pref. .	4 1/4—5 1/8	..	4 17 7
120,000	Stk.	June 27	4	Do. 4 p.c. Deb. Stk.	87—89	..	4 9 11	521,600	100	Dec. 1	4	,, 4 p.c. Deb. .	92—94	..	4 5 1
245,771	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	91—93	+1 1/2	4 6 0	346,198	Stk.	June 27	4	River Plate 4 p.c. Deb.	88—90	..	4 8 11
100,000	10	—	—	Cape Town & Dis., Ltd.	2—3	..	—	275,000	5	Sept. 26	12	San Paulo, Ltd. . . .	—	..	—
100,000	10	—	—	Do. 4 1/2 p.c. Pref. .	2 1/2—4 1/2	—1/2	—	150,000	10	,,	6	Do. 6 p.c. Pref. .	11—11 1/2	..	5 4 4
100,000	Stk.	June 27	4 1/2	Do. 4 1/2 p.c. Deb. Stk.	76—80	..	5 12 6	125,000	50	July 1	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
157,150	Stk.	Aug. 14	5	Chester 5 p.c. Ord. . .	109—111	.	4 10 1	135,000	Stk.	Aug. 28	10	Sheffield A	222—224	..	4 9 8
1,513,280	Stk.	Aug. 28	5/9/4	Commercial 4 p.c. Stk.	106—108	+1/2	5 1 2	209,984	,,	,,	10	Do. B	221—223	..	4 9 8
560,000	,,	,,	5 1/2	Do. 3 1/2 p.c. do. .	102 1/2—104 1/2	..	5 2 0	528,500	,,	,,	10	Do. C	220—222	..	4 10 1
475,000	,,	Dec. 11	3	Do. 3 p.c. Deb. Stk.	70—72*	..	4 3 4	90,000	10	Oct. 15	7 1/2	South African . . .	9 1/2—10 1/2	..	7 2 10
800,000	Stk.	,,	4 1/2	Continental Union, Ltd.	79—82*	..	5 9 9	6,429,895	Stk.	Aug. 14	5/9/4	South Met., 4 p.c. Ord.	109—111	..	4 18 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	121—123*	..	5 13 10	1,895,445	,,	July 11	3	Do. 3 p.c. Deb.	72—74	..	4 1 1
492,270	Stk.	—	5 3/4	Derby Con. Stk. . . .	123—125	..	4 12 0	209,820	Stk.	Aug. 14	8 1/2	South Shields Con. Stk.	157—159	..	5 6 11
55,000	,,	—	4	Do. Deb. Stk. .	102—104	..	3 16 11	952,795	Stk.	,,	6	S'th Suburb'n Ord. 5 p.c.	115—117	..	5 2 7
1,002,180	10	July 30	10	European, Ltd. . . .	17—18	..	5 11 1	60,000	,,	,,	5	Do. 5 p.c. Pref. .	113—115	..	4 6 11
16,386,660	Stk.	Aug. 14	4/17/4	Gas- 4 p.c. Ord. . .	102—104	..	4 13 8	117,058	,,	June 27	5	Do. 5 p.c. Deb. Stk.	115—117	..	4 5 6
2,660,000	,,	,,	3 1/2	light 3 1/2 p.c. max. .	74—77	..	4 10 11	594,740	Stk.	Nov. 13	5	Southampton Ord. . .	100—103	..	4 17 1
4,062,235	,,	,,	4	and 4 p.c. Con. Pref.	93—96	..	4 3 4	120,000	Stk.	Aug 14	7 3/8	Tottenham A 5 p.c. .	137—140	..	5 5 4
4,674,850	,,	Dec. 11	3	Coke 3 p.c. Con. Deb.	70 1/2—72 1/2*	..	4 2 9	543,940	,,	,,	5 1/2	and B 3 1/2 p.c. .	115—117	..	5 0 5
258,740	Stk.	Sept. 11	5	Hastings & St. L. 3 1/2 p.c.	83—90	..	5 11 1	149,470	,,	June 27	4	Edmonton 4 p.c. Deb.	90—92	..	4 7 0
82,500	,,	,,	6 1/2	Do. do. 5 p.c.	—	..	—	182,380	10	,,	5	Tuscan, Ltd.	5—6	..	8 6 8
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16 3/4—17 1/4	..	6 7 6	149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	96—98	..	5 2 0
131,000	Stk.	Sept. 11	7 1/8	Ilford A and C . . .	150—153	..	4 19 8	236,476	Stk.	Aug. 14	5	Tynemouth, 5 p.c. max.	111—113	..	4 8 6
65,780	,,	,,	6 1/8	Do. B	118—120	..	5 2 1					Wandsworth, Wimbledon, and Epsom—			
65,500	,,	June 27	4	Do. 4 p.c. Deb. . .	89—91	..	4 7 11								
4,940,000	Stk.	Nov. 13	9	Imperial Continental .	166—171	+2	5 5 3	30,000	Stk.	Aug. 28	8 3/8	Wandsworth A 5 p.c.	155—160	..	5 4 8
1,235,000	Stk.	Aug. 14	8 1/2	Do. 3 1/2 p.c. Deb. Red.	83 1/2—85 1/2	..	4 1 10	255,636	,,	,,	6 1/2	,, B 3 1/2 p.c.	130—135	..	5 1 10
200,242	Stk.	Aug. 28	6 1/2	Lea Bridge Ord. 5 p.c. .	118—121	..	5 3 4	108,075	,,	,,	5/17/3	,, C 3 1/2 p.c.	110—115	..	5 2 0
561,000	Stk.	,,	10	Liverpool United A .	210—212	+2	4 14 4	352,000	,,	,,	6 1/2	Wimbledon 5 p.c. .	111—116	..	5 5 7
718,100	,,	,,	7	Do. B .	143—145	+1	4 16 7	98,000	,,	,,	6 3/8	Epsom 5 p.c. . . .	115—120	.	5 10 5
806,083	,,	June 27	4	Do. Deb. Stk.	95—97	..	4 2 6	88,416	,,	June 27	3	3 p.c. Deb. Stk. . .	68—70	..	4 5 9
63,480	Stk.	June 27	3	Maidstone 3 p.c. Deb. .	66 1/2—68 1/2	..	4 7 7								

Prices marked * are "Ex-Div."

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

GENERAL MANAGER. Leeds Gas Department. Applications by Dec. 20.
WORKING MANAGER. (Woodall Spa Gas). Applications to E. J. Brockway, Cleethorpes.
GENERAL WORKS FOREMAN. No. 5823.
RENTAL CLERK AND BOOKKEEPER. No. 5825.
ASSISTANT RENTAL CLERK. No. 5824.
PUPIL WANTED. No. 5815.

Plant, &c. (Second Hand), for Sale.

RETORTS AND MOUTHPIECES. Newcastle-on-Tyne Gas Company.

Plant, &c. (Second Hand), Wanted.

GASHOLDER AND TANK (TEST ROOM). No. 5814.

Patent Licence.

DISTILLING AND COKING COAL.—Marks and Clerk, 57 and 58, Lincoln's Inn Fields, W.C.

TENDERS FOR

Gasholder and Tank.

NEW HUNSTANTON URBAN DISTRICT COUNCIL. Tenders by Dec. 23.

Pipes.

SHEFFIELD GAS COMPANY. Tenders by Jan. .

Purifiers.

DOUNE GAS WORKS.

Steel Roof, Railway Gantries, &c.

DARLINGTON CORPORATION. Tenders by Jan. 7.

Tar and Liquor.

GAINSBOROUGH GAS DEPARTMENT, Tenders by Dec. 27.
HARWICH GAS COMPANY, Tenders by Jan. 3.
BRECON GAS COMPANY. Tenders by Jan. 6.

BOOKS AND LEAFLETS

TO BE OBTAINED OF

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

A COMPLETE ACCOUNT OF THE GRANTON GAS-WORKS OF THE EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS, their Design, Construction, and Equipment, with Illustrations, Plates, and Details of Costs.—By W. R. HERRING, M.Inst.C.E., &c. 300 Pages and 28 large folding Plates. *Price 16s. net cash.*

A HISTORY OF THE INTRODUCTION OF GAS LIGHTING. — By CHARLES HUNT, M.Inst.C.E *Price 8s.*

PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS AND WATER UNDERTAKINGS, 1891-1901 (the Volume for 1879-1890 is still on Sale).—By E. H. STEVENSON and E. K. BURSTAL, MM.Inst.C.E. *Price 21s.*

GASHOLDERS WITH OR WITHOUT GUIDE-FRAMING.—A Discussion between E. LLOYD PEASE and F. SOUTHWELL CRIPPS. *Price 1s.*

TECHNICAL GAS ANALYSIS. — By CLEMENS WINKLER. Second Edition. *Price 10s. 6d.*

CHEMISTRY FOR ENGINEERS AND MANUFACTURERS. Vol. II. — By BLOUNT and BLOXAM. *Price 16s.*

THE POWERS OF CHARGE OF THE METROPOLITAN GAS COMPANIES.—By LAURENCE W. S. ROSTRON, M.A., B.C.L., of New College, Oxford, and Lincoln's Inn, Barrister-at-Law. With a Preface by GEORGE LIVESEY, M.Inst.C.E. *Price 6s.*

REPORTS OF DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1912. *Price 5s. 6d.*

CONSPIRACY AND PROTECTION OF PROPERTY ACT.—*Price 2s. per dozen*, or *10s. 6d. per* 100; printed on broadsides sheets.

THE COMPOSITION AND USE OF GAS LIME IN AGRICULTURE.—By (the late) Dr. VOELCKER, Professor of Chemistry to the Royal Agricultural Society of England. *Price 5s. per* 100.

SALE OF GAS APPARATUS. — By J. PATER WIATT, Author of "Chemistry in Physics," "Internal Combustion Engines," &c., &c. *Price 1s. net.*

BIRMINGHAM CORPORATION (Windsor Street) GAS-WORKS.—By CHARLES HUNT, M.Inst.C.E, *Price 21s.*

Other Books supplied (Post Free) at Published Prices.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

CHRISTMAS HOLIDAYS.

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